Health Beliefs, Lifestyle Behaviors, and Body Mass Index in College Students

Trisha Williams
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Health Beliefs, Lifestyle Behaviors, and Body Mass Index in College Students

DISSERTATION
Presented in Partial Fulfillment of the Requirements for the Degree of
Doctor of Philosophy
Lynn University

By
Trisha Williams

December 4, 2012.
HEALTH BELIEFS, LIFESTYLE BEHAVIORS, AND BODY MASS INDEX IN COLLEGE STUDENTS

Williams, Trisha L., Ph.D.

Lynn University, 2002

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Thank you all. Without your support, this accomplished goal could not have been possible.
Abstract

Poor nutrition habits, sedentary living, and alcohol consumption are all chosen lifestyle behaviors governed by the health beliefs of individuals. Findings have consistently confirmed that college students have poor dietary habits and continue to make poor nutritional choices. Between 70% and 90% of all deaths in the United States are the results of chronic diseases, and 40% of deaths result from lifestyle behaviors and choices (Aldana, Greenlaw, Salberg, Diehl, Thomas & Ohmine, 2006; Grizzell, 2005).

This research examined the differences in the body mass index of normal and overweight college students in the United States according to their personal characteristics, nutrition knowledge, and dietary self-efficacy. The study posed three research questions pertaining to differences in the body mass index of college students. As such, three research hypotheses were tested to determine whether there are significant differences in the body mass indexes of normal and overweight college students according to their personal characteristics, nutrition knowledge, and dietary self-efficacy. This study employed a non-experimental quantitative exploratory (comparative) research design. A convenience sample of 201 was recruited via SurveyMonkey. Out of 201 college students that completed surveys, 126 were usable. The questionnaire consisted of Part 1, personal characteristics; Part 2, nutrition knowledge; Part 3, dietary self-efficacy; and Part 4, body mass index.

Statistical Package for the Social Sciences (SPSS) version 18 was used to analyze the findings of this non-experimental quantitative exploratory (comparative) research. Data analysis was conducted using descriptive and comparative analyses. This study's findings indicated that the personal characteristics of college students do not influence
their body mass index. These results were different from studies that have indicated personal characteristics, such as gender, race, and age, have had statistically significant effects on the level of engagement in health promoting behaviors and lifestyle (Anding et al., 2001; Huang, Haris, Lee, & Nazir, 2003; Jackson, Tucker, & Herman, 2007). The findings of this study were similar to Parmenter and Wardle’s (1999) results were students tended to concentrate on a specific area of nutrition knowledge. There were two main areas that indicated significant differences “Total Dietary Recommendations” and “Total Choosing Everyday Foods”. College students within a normal BMI category (BMI between 18.5 to 24.9), were much more likely to, know and understand what current experts say about healthy dietary recommendations, over college students within an overweight BMI category (BMI of 25 to 29.9). The results also indicated that college students within a normal BMI category, were much more likely to choose between different foods to identify a healthier choice, over college students within an overweight BMI range. There were no correlations between dietary self-efficacy and BMI in this study. The findings indicate that more research is needed to gain a clearer understanding and to investigate whether there are correlations between nutrition knowledge, dietary self-efficacy, and dietary behavior. It may be valuable to institute awareness programs at targeted BMI students to improve their nutrition awareness.
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Chapter 1: Introduction to the Study

Introduction and Background to the Study

Several theories have proposed that various relationships exist between attitude, intentions, and beliefs that guide or influence a particular behavioral outcome (Azjen, 1991; Glanz, Rimer, & Lewis, 2002; Luszczynska, Scholz, & Schwarzer, 2005). To date, all these theories, including the Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Health Belief Model (HBM), and Social Cognitive Theory (SCT), have been used in several empirical studies as means of understanding different types of beliefs (behavioral and normative), attitudes, and intentions (Azjen, 1991; Glanz et al., 2002). Several theoretical models have identified gaps in the relationships between frameworks and suggested a need for further study in a given area (Ajzen, 1991). The literature has also produced mixed results regarding factors affecting health beliefs, lifestyle behaviors, and body mass index (BMI) among college students. Within the literature, several different health models and theories are used to understand and explain the different behaviors and factors that affect the health and well-being of college students.

Several studies have also found that college student perceptions, opinions, and beliefs regarding health risk behaviors have an impact on the way they ultimately behave. Self-efficacy is consistently emphasized as a determining factor in achieving a desired behavior. Findings have also indicated that college students' poor nutritional habits and choices may result not only from health risk behaviors but also a lack of proper nutrition knowledge (Anding, Suminski, & Boss, 2001; Grizzell, 2005).
The TRA (Ajzen & Fishbein, 1967), TPB (Ajzen & Fishbein, 1973), SCT (Miller & Dollard, 1941), and HBM (Hochbaum, Rosenstock, & Kegels, 1950) have been instrumental in facilitating new behavioral research relevant to health communication and education fields (Glanz, Lewis, & Rimer, 1997). In addition, they provided frameworks for designing, implementing, and evaluating intervention programs (Glanz et al., 1997). These theories and models have been used to guide the development of messages meant to persuade individuals to make certain health decisions. In this way, they have been useful in health education and intervention programs for diabetes, drug use, physical inactivity, healthy eating habits, smoking cessation, hypertension, eating disorders, contraceptive use, or breast self-examinations (Azjen, 1991; Glanz et al., 2002; Jemmott & Fong, 1992; Luszczynska et al., 2005; Montano & Taplin, 1991). Ajzen and Fishbein's (1973) TPB is currently a predominant model that may be used to assess behavior, intentions, and health-related issues. The TPB is an extension of the TRA (Ajzen & Fishbein, 1980), which explains behavior more broadly and accounts for factors outside the control of individuals (Azjen, 1991; Glanz et al., 1997).

The TRA is a well-developed theory used for describing, exploring, explaining and predicting behavior. Mullen, Hersey, and Inverson (1987) criticized the theory, stating that it does not recognize emotional fear-arousal elements, such as perceived susceptibility to illnesses. Ajzen's (1991) TRA is also limited due to its assumption that behavior is under voluntary control. Irrational decisions, habitual actions, or any behavior that is not consciously considered cannot be explained by this theory (Azjen, 1991; Glanz et al., 1997). Another limitation of the TRA is that it must be used in conjunction with other theories and models, such as the Self-Regulation Theory (Leventhal & Cameron,
1987) or Protection Motivation Theory (Rogers & Mewborn, 1976), to better explain behavior. Its major proposition is that behavioral performance is associated with certain attributes or outcomes.

The TPB introduces two additional major constructs (control belief and perceived power) to the existing four constructs presented by the TRA. This leads to six constructs, identified as behavioral belief, evaluation of behavioral outcomes, normative belief, and motivation to comply, and the additional control belief and perceived power. The major proposition of the theory is that, “perceived control is determined by control beliefs concerning the presence or absence of resources for and impediments to behavioral control, weighed by the perceived power or impact of each resource and impediments to facilitate or inhibit the behavior” (Glanz et al., 1997, p. 92). A study by Ajzen (1991), verifies the control beliefs proposition, providing this theory with empirical validity. The TPB is a well-developed means of identifying both behaviors and intentions. However, most studies have used a single measure of perceived control rather than computing perceived control from measures of control beliefs and perceived power. Practitioners who develop intervention programs or target environmental factors and populations in which control beliefs are most strongly associated with intentions and behaviors have used this theory.

The HBM has a weakness, namely that health beliefs compete with the other beliefs and attitudes of individuals that also have an influence on behavior. The HBM has been used in social psychology research to verify that belief formation always precedes behavioral change. The HBM identifies the following four major constructs that represent perceived health threats and net benefits: perceived susceptibility, perceived severity,
perceived benefits, and perceived barriers. In 1998, the concept of cues to action and self-efficacy were adapted to the model by Rosenstock et al. (1974) to help the HBM become better suited to the challenges of changing unhealthy behaviors. The major propositions of the HBM are based on the understanding that a person will take a health-related action if that person: (a) feels that a negative health condition can be avoided, (b) has the positive expectation that taking a recommended action will prevent a negative health condition, and (c) believes that he/she can successfully take a recommended health action (Glanz et al., 2002).

SCT is a well-developed theory used for describing, exploring, explaining, and predicting behavior; however, health educators and behavioral scientists have argue that it is too complex in its formulation and have suggested more parsimonious theories (Glanz et al., 1997). Additionally, Domel (1994) criticized the theory by suggesting more attention to be paid to the nonlinear aspects of the SCT; for instance, self-efficacy should be used to predict behavior primarily when positive outcome expectations are high (Domel, 1994). The empirical validity of the SCT is in question because several funded, large-scale intervention studies have been conducted using SCT constructs but have not resulted in changed behaviors (Carleton, 1995; Fortmann, 1993; Luepker, 1994).

SCT identifies several constructs, including environment, situation, behavioral capability, expectations, expectancies, self-control, observational learning, reinforcements, self-efficacy, emotional coping responses, and reciprocal determinism. The major proposition of the theory is that evaluating behavioral changes depends on the factors—among them, environment, people and behavior—that are constantly interacting and affecting each other. An environment that can be categorized as social and physical
can affect a person’s behavior. The social environment consists of family members, friends, and colleagues, while the physical environment could be a place of study or work and might be characterized by the temperature of a room or the availability of certain foods.

The SCT has been useful in the development of interventions programs now being implemented in Project Northland’s Amazing Alternatives to prevent alcohol use in adolescents (Perry, 1993; Williams 1995). The SCT has also been used in the development of the program Gimme 5 Fruit, Juice and Vegetables for Fun and Health, designed to increase availability and accessibility of fruits and vegetables for children (Dormel, 1994). It has been used in nutrition and health studies under the self-efficacy construct, which is part of Bandura’s SCT, and has been used to understand behavior in relation to many components of the diabetes self-care regimen (Allen, 2004). It is an effective model from which to explore influential constructs of health behavior. There are several studies that have demonstrated effective nutrition intervention by using SCT to significantly improve dietary self-efficacy among different populations, such as urban Native American children and adolescents (Smith & Rinderknecht, 2003).

Empirical studies have found that dietary patterns are influenced by socio-cultural and other demographic and lifestyle factors. Furthermore, relationships among certain foods or combinations of foods may be associated with specific disease risks (Boreham, Savage, Drimrose, Gran & Strain, 1993; Park, Murphy, Wilkens, Yamamoto, Sharmas, Hankin, Henderson, & Kolonel, 2005; United States Department of Agriculture (USDA), 1995). Studies have indicated that personal characteristics, such as gender, race, and age, have had statistically significant effects on the level of engagement in health promoting
behaviors and lifestyle (Anding et al., 2001; Huang, Haris, Lee, & Nazir, 2003; Jackson, Tucker, & Herman, 2007). Study findings have also confirmed that self-variables, such as health self-efficacy and health values, are significant predictors of engagement in health promoting lifestyles among college students (Jackson et al., 2007; Luquis, Garcia & Ashford, 2003; McAthur, Rosenberg, Grady & Howard, 2002). Research has confirmed that college students’ diets reflect a pattern low in energy, fiber, calcium, iron, vitamin A, and carotenoids, but high in fat (Anding et al., 2001; Binger, 1999; Huang et al., 2003; Hertzler, Webb & Frary, 1995; Welshimer & Anderson 1999; McAthur et al., 2002). College students continue to engage in unhealthy lifestyle behaviors such as poor eating, drinking alcohol, not exercising, and smoking, despite the serious consequences (Anding et al., 2001; Dzokoto et al., 2007; Jackson et al., 2007; Luquis et al., 2003; McAthur et al., 2002).

Over the years, several studies specifically focused on chronic diseases have documented the fact that major causes of morbidity and mortality in the U.S. develop in a person at a young age, resulting in more American children and teenagers who are overweight (Center for Disease Control and Prevention, 2003). As Casazza and Ciccazzo asserted, “Behavioral patterns established during adolescence are likely to influence long-term health behavior and may have a tremendous impact on life-long health” (Casazza & Ciccazzo, 2007 p. 73).

A study conducted by Huang, Harris, Lee, and Nazir (2003) aimed to assess the rate of overweight conditions, obesity, dietary habits, and physical activity in college students at the University of Kansas, using a cross-sectional exploratory (comparative) research design to document these tendencies. The author’s descriptive findings
confirmed that a high percentage of those students surveyed were overweight and engaged in less than healthy dietary habits, suggesting that greater attention should be paid to diet and exercise. Findings were similar to and consistently in support of national samples when compared. Weight, BMI, physical activity, and intake of fruit, vegetables, and fiber were below national levels for these same factors. The authors concluded that a large majority of college students are overweight, obese, and failing to meet minimum dietary and physical activity guidelines.

A similar study conducted by Anding et al. (2001) used a non-experimental approach in order to assess the level of college women’s compliance with the Dietary Guidelines for Americans (DGA). Empirical studies about college students’ diets, exercise habits, and alcohol consumption were examined, leading to a major gap in the literature about the degree to which college women comply with the Dietary Guidelines for Americans (Anding et al., 2001). The strengths the authors reported were that this was the first study to address a group of American college women’s compliance with all of the dietary guidelines, and their findings were comparable to large studies that had been conducted in respect to DGA guidelines. The authors reported that the preliminary study findings regarding diets and activities of college women could not be generalized (Anding et al., 2001).

Jackson et al. (2007) conducted a study of college students that explored the roles health values, social supports such as family and friends, and self-efficacy played in health-promoting lifestyles. The findings indicated that “self variables, health self-efficacy and health value, were significant predictors of engagement in a health-promoting lifestyle among college students providing support for health-promoting
interventions that empower college students to make positive health decisions" (Jackson et al., 2007, p. 74). These findings supported Pender’s Health Promotion Model by suggesting “that engagement in health behavior is a function of the value attached to the outcome of good health and personal beliefs” (Jackson et al., 2007, p. 74), such as self-efficacy. This led the authors to develop the following conclusions: (1) new lifestyles and experiences in college may lead to unhealthy behaviors; (2) colleges and universities may be an ideal setting for intervention programs that promote healthy lifestyles; and (3) empowering and effective health promotion programs require research that targets the factors that contribute to health-promoting lifestyles among college students.

All these studies, exemplified by Anding et al. (2001), Huang et al. (2003), and Jackson et al. (2007), have indicated that personal characteristics, such as gender, race, and age, have had significant main effects on the level of engagement in health-promoting behaviors and lifestyle. Study findings also confirm that self-variables, health self-efficacy, and health values have been significant predictors of engagement in health promoting lifestyles among college students (Jackson et al., 2007; Luquis et al., 2003; McAthur et al., 2002). In particular, health behaviors are a function of value attached to the outcome of good health and personal beliefs (e.g., self-efficacy) (Jackson et al., 2007; Jette, Cummings, Brock, Phelps & Naessens, 1981).

Research in the area of health and well-being tends to focus on weight loss in obese people or educational intervention programs to prevent weight gain (Byrd-Bredbenner et al., 1998; Fine, Conning, Firmin, DeLosowsky, Richard, & Webster, 1994; Matvienko, Lewis, & Schafer, 2001; Sandoval & Miller, 1989). Numerous studies have documented that nutrition education enables people to make informed decisions and
therefore improves their body mass index and health (Anding et al., 2001; Byrd-Bredbenner et al., 1998; Fine et al., 1994; Huang et al., 2003; Jackson et al., 2007; Matvienko et al., 2001). Research has indicated that an individual’s college period is a very influential time during which students tend to make unhealthy choices. Nutrition education at the college level can result in many positive lifestyle changes that can help achieve goals of nutrition and health specified in the DGA (USDA, 2000) and in Healthy People 2010 (HHS, 2000) (Hiza & Gerrior, 2002).

Previous research has explored the relationship between nutrition knowledge and food intake. Mixed results have been reported (O’Brien & Davies, 2007). Even fewer studies, have investigated whether nutrition knowledge is associated with BMI in adults. A study conducted by O’Brien and Davies (2007) investigated the relationship between nutrition knowledge and body mass BMI. A study by Thakur and D’Amico (1999) also determined whether a lack of nutrition knowledge and obesity can be correlated using BMI in adolescents. There are even fewer studies that have combined looking at nutrition knowledge and dietary self-efficacy in various populations. Kwon, Han, and Chung (2008) conducted a study in Korea that investigated the relationship of nutrition knowledge, dietary self-efficacy and the dietary behavior of nutritionists. There are also limited, if any, reported studies that have investigated nutrition knowledge and dietary self-efficacy particular to college students. However, no documented studies have combined an examination of nutrition knowledge and dietary self-efficacy, using BMI as the measure.

This study was an extension of many of the existing studies, such as Huang et al. (2003), which assessed the rate of overweight, obesity, dietary habits, and physical
activity in college students at the University of Kansas. Also, Anding et al. (2001), assessed the level of college women’s compliance with all the DGA using BMI as their measure. More research is needed to gain a clearer understanding to investigate whether nutrition knowledge, dietary self-efficacy, and dietary behavior are correlated. The current study has not only provided further research in this area of study but also new data, which uses a reliable measure of BMI to document differences in a sample of college students in South Florida. The current study has also brought a unique perspective to the field, as it concentrates on two groups of college students with normal and overweight BMIs. Therefore, this study has examined the differences of BMIs for normal and overweight college students in the United States, according to their personal characteristics, nutrition knowledge, and dietary self-efficacy.

College students are at a vulnerable time in their lives as they have less parental control and have more freedom to make their own decisions and lifestyle choices. Some of these lifestyle choices or behaviors may have the potential to affect their immediate and future health (Dawson, Schneider, Fletcher, & Bryden, 2007). Several types of studies have been conducted on college students’ perceptions, opinions, and beliefs about health risk behaviors (Dzokoto et al., 2007; Luquis et al., 2003; McAthur, Rosenberg, Grady & Howard, 2002). Cross-sectional studies by Rosenstock and colleagues (1994), exploratory (comparative) research by Hiza and Gerrior (2002), a descriptive study by Myers and colleagues (2004), intervention and longitudinal studies by the U.S. Department of Agriculture, and a series of seven studies over a 10 year period by Hattie et al. (2004), have been conducted on health beliefs and the self-efficacy of college students. Measures used to analyze health beliefs and self-efficacy include the General
Self-Efficacy Scale (Luszcynska et al., 2005), the Youth Behavior Survey (Huang et al., 2003), the Self-Rated Scale (Jackson et al., 2007), Marlowe-Crowne Social Desirability Scale (Jackson et al., 2007), Health Promoting Lifestyle Profile II (Jackson et al., 2007), Self-Rated Abilities for Health Practice Scale (Jackson et al., 2007), the Wellness Evaluation of Lifestyle (WEL) (Myers, Thomas, Sweeney, & Witmer, 2004). All these instruments have been documented as being valid and reliable.

Empirical studies on different factors guiding decision making of specific health and lifestyle behaviors of college students have been examined. Some factors that have been explored are the role of health values, social support, such as family and friends and self-efficacy (Aldana et al., 2006; Dzokoto et al., 2007; Jackson et al., 2007; Luquis et al., 2003). Several types of studies have been conducted on the lifestyle behaviors of college students, including one using cross-sectional exploratory (comparative) and explanatory (correlation) research by Jackson et al. (2007), a descriptive study by Luquis et al. (2003), a non-experimental exploratory comparative research study by Anding et al. (2001), and cross-sectional explanatory exploratory (comparative) research by Huang et al. (2003). Measurements used to analyze behavior include the Youth Behavior Survey (Huang et al., 2003), the Self-Related Scale (Jackson et al., 2007), Marlowe-Crowne Social Desirability Scale (Jackson et al., 2007), Health Promoting Lifestyle Profile II (Jackson et al., 2007), Self-Rated Abilities for Health Practice Scale (Jackson et al., 2007), WEL (Myers et al., 2004). As stated above, the validity and reliability of all these instruments have been documented.

Different methods have been used to measure nutrition, diet quality, and nutritional status. These include Block Brief 2000 Dietary Questionnaire (Huang et al.,
2003; Boucher, Cotterchio, Kreiger, Nadalin. Block, T., & Block, G., 2006), the Healthy Eating Index (Hiza & Gerrior, 2002), the Self-Related Scale (Jackson et al., 2007), the WEL (Hattie et al., 2002; Myers et al., 2004) and the 3-Day Food Record (Anding et al., 2001). All these measures have been documented as reliable and valid. Even though several different instruments have been used to measure and assess the nutritional status or dietary quality, findings are similar in that they indicate that college students consume less than the recommended minimum serving from the Food Guide Pyramid and/or do not meet the recommendations of the DGA (Anding et al., 2001; Hiza & Gerrior, 2002; Huang et al., 2003; Park et al., 2005).

Studies have examined the effectiveness of the nutrition education of college students in nutrition knowledge, improved healthy dietary changes, and overall food choices (Gillespie & Shafer, 1990; Lazarus, Weinsier & Booker, 1993; Lin, Guthrie & Blaylock, 1996; Morton & Guthrie, 1998; Skinner, 1991; Thomsen, Terry, & Amos, 1998). It is recommended that exposure to nutrition education, regardless of the individual’s age, may serve as a catalyst for the development of lifelong behaviors that improve BMI and overall health.

Several empirical studies by Anding et al. (2001), Hiza and Gerrior (2002), and Huang et al. (2003), have assessed the health and well-being of college students. Hiza and Gerrior (2002) conducted a non-experimental study, Anding et al. (2001) conducted an exploratory (comparative) research study, and Huang et al. (2003) used a cross-sectional, exploratory research design to test the proposed relationship between dietary behaviors and health. Measurements of health and well-being are Self-Rated Abilities (Jackson et al., 2007), the Health Practices Scale (Jackson et al., 2007), and the BMI
(Anding et al., 2001; Jackson et al., 2007; Huang et al., 2003). The Block Brief 2000 Dietary Questionnaire (Boucher et al., 2006; Huang et al., 2003), the Healthy Eating Index (Hiza & Gerrior, 2002; Center for Diseases Control; U.S. Department of Agriculture), the Self-Related Scale (Jackson et al., 2007), the WEL (Myers et al., 2004), and the Self-Reported Activity Scale (SRPA) (Anding et al., 2001) are used as well. Several nutrition intervention studies have been conducted using these measurements, which have been proven valid and reliable.

Due to the nature of this research, the documented results may be applied to a variety of fields, such as nutrition, psychology, and the social sciences. College students are at a vulnerable time in their lives as they have less parental control and have more freedom to make their own decisions and lifestyle choices. College students are also regarded as nutritionally vulnerable because their diets are often low in energy and high in fat (Franciscy, McAuthur, & Holbert, 2004). This study may be beneficial not only to practitioners but also the general population and, in particular, college students. This research may be used to implement nutrition programs in colleges as well help practitioners understand the underlining factors that motivate college students' eating habits.

Research questions and research hypotheses were proposed in order to understand the significant differences in nutrition as measured by the BMI of college students according to their personal characteristics, nutrition knowledge, and dietary self-efficacy. These are based on key gaps in the literature, and the theoretical framework that guided this study.
Purpose

More research is needed to gain a clearer understanding and investigate whether there are correlations between nutrition knowledge, dietary self-efficacy and dietary behavior. There are also few, if any, reported studies that have investigated nutrition knowledge and dietary self-efficacy particularly in reference to college students. However, there are no documented studies that have used the BMI as measure for a combined examination of nutrition knowledge and dietary self-efficacy. Therefore, the primary purpose of this research is to examine the differences in BMIs of normal and overweight college students in the United States according to their personal characteristics, nutrition knowledge, and dietary self-efficacy.

Definition of Terms

Demographic characteristics.

Theoretical definition. Demographic profile, referred to here as demographic characteristics, as defined by the U.S. Census Bureau, “includes tables that provide various demographic, social, economic, and housing characteristics for the U.S., regions, divisions, states, counties, minor civil divisions in selected states, places, metropolitan areas, American Indian and Alaska Native areas, Hawaiian home lands and congressional districts” (U.S. Census Bureau, 2002, Demographic Profiles Section, p. 1).

Operational definition. Demographic characteristics describe the population or demographic outlines used in research. Commonly used demographics include race, age, income, educational attainment, employment status, and location (Miller & Salkind, 2002). In this study, Part 1 of the survey was developed by the researcher and contained seven items designed to measure demographic characteristics. In this study demographic
characteristics has been measured by age, gender, marital status, race, ethnicity, employment status, and level of college completed (see Appendix A, Part 1).

**Nutrition knowledge.**

*Theoretical definition.* Nutrition is the science or practice of taking in and utilizing foods (Whitney & Rolfes, 2005). Nutrition knowledge refers to the application of nutrition information to improve health and prevent and cure diseases (Whitney & Rolfes, 2005).

*Operational definition.* In this study, Part 2 of the survey measures nutrition knowledge using questions presented in the Parmenter and Wardle (1999) questionnaire. The questionnaire was developed to analyze the relationship between nutrition knowledge and dietary behavior. In this study the questionnaire measured the level of nutrition knowledge through 44 questions. The construct nutrition knowledge has been measured through four variables. The questionnaire measure four variables related to nutrition knowledge, which addresses current dietary recommendations, sources of nutrients, everyday food choices, and diet-disease relationships (Parmenter & Wardle, 1999).

**Dietary Self-efficacy.**

*Theoretical definition.* General self-efficacy according to Albert Bandura, is “the belief in one’s capabilities to organize and execute the courses of action required to manage prospective situations” (Bandura, 1997, p. 2). In other words, self-efficacy is a person’s belief in his or her ability to succeed in a particular situation. Bandura (1997) described these beliefs as determinants of how people think, behave, and feel. Dietary self-efficacy therefore, is person’s belief in his or her ability to succeed or stay true to
dietary goals (Bandura, 1997). Dietary self-efficacy has been demonstrated in several health behavior theories as being a key component for successful behavior change. A person with high dietary self-efficacy does not simply think they can probably stick with a diet, instead, they have an inner confidence in their ability to resist temptations and to bounce back if given into temptations.

**Operational definition.**

In this study, Part 3 of the survey measured dietary self-efficacy using questions presented in the Dietary Confidence Survey by Sallis, Pinski, Grossman, Patterson and Nadar (1988). In this study the Dietary Confidence Survey measured dietary self-efficacy through 20 questions, which measured the degree to which subjects are sure they can make dietary behavior changes. The construct dietary self-efficacy has been measured through a series of questions presented by a four point rating scale which measures how confident the individual is to sticking to the health-related behaviors relating to diet and exercise behaviors. Respondents rate the importance or accuracy of their reasons for their eating habits using a 4-point Likert scale with anchor ratings of 1= “I know I cannot”, 2= “Maybe I can”, 3 = “I know I can”, 4 = “Does not apply” (Sallis et al., 1988).

**Body mass index.**

**Theoretical definition.** Body mass index (BMI) is a measure of body fat based on height and weight that applies to both adult men and women according to the following categories.

BMI categories:

- Underweight ≤ 18.5
- Normal weight = 18.5-24.9
Overweight = 25-29.9

Obesity = ≥ 30

**Operational definition.** In this study, Part 4 of the survey contains two questions regarding height and weight of the students. In this study, BMI has been measured and calculated using the self-reported students' height (without shoes) in feet and inches, and weight (with clothes) in pounds. The researcher calculated BMI using the BMI device provided by the Department of Health and Human Services' National Institute of Health website at http://www.nhlbisupport.com/bmi/.

Also, the definitions of terms used in this research are defined as followed:

**Lifestyle.**

*Lifestyle* has been defined as a “system of individual differences in the habitual use of declarative and procedural knowledge structures that intervene between abstract goal states (personal values) and situation-specific product perceptions and behaviors” (Bruns, Scholderer & Grunert, 2002, p. 666). Throughout the literature, lifestyle behaviors refer to the choices made by the individual.

**Lifestyle behaviors.**

*Lifestyle behaviors* are the daily choices that individuals make regarding strategies to cope with stress, diet, and physical activity, which are the leading determinants of good health (Grizzell, 2005). There are some factors or predictors, such as being in a particular income category, working full-time, caring for a family, having social support, additional body weight, and physical inactivity that may influence or cause certain lifestyle behaviors (Dawson et al., 2007).
Health beliefs.

Health beliefs may also influence specific lifestyle behaviors and are defined as personal convictions that threatening health problems are serious and have potentially negative consequences for a person’s lifestyle (Glanz et al., 1997).

Health behavior.

Health behavior is an action taken by a person to maintain, attain, or regain good health and prevent illness. Health behaviors reflect a person's health beliefs. Some common health behaviors are exercising regularly and eating a balanced diet (Grizzell, 2005).

Healthy People 2010.

Healthy People 2010 (Davis, 2000) has provided a framework for prevention through a national health objective designed to identify the most significant preventable threats to health and establish national goals to reduce those threats. Different people, states, communities, professional organizations, and others incorporate these on different levels in the development of programs to improve health.

Dietary Guidelines for Americans.

The DGA provides sound advice for healthy individuals who want to improve their diets and reduce their risk of developing chronic diseases (Dawson et al., 2007). The Department of Health and Human Services (HHS) and the Department of Agriculture (USDA) have jointly published a version of the DGA every five years since 1980.

Recommended Dietary Allowance

The Recommended Dietary Allowance (RDA) is the average daily amount of nutrients considered adequate to meet the known nutrient needs of practically all healthy
people, and should be the goal for the dietary intake of individuals (Whitney & Rolfes, 2005, p. 14).

**Nutritional assessments**

*Nutritional assessments* are measurements of the nutritional health of the body. They can be anthropometric measurements such as BMI, biochemical tests, chemical observations, and dietary intake, as well as medical history (Whitney & Rolfes, 2005).

**Health and wellness**

Overall, *health* has been defined as the absence of disease, mental and physical problems and *wellness* has been defined as the way people feel about their physical, mental, social, and emotional well-being (Luquis et al., 2007).

**Well-being**

General *well-being* is documented and evaluated in terms of three major components: life satisfaction, negative effect, and positive effect (Chamberlain, 1988). Research by Pilcher and Ott (1998) documented their assessment of the more global concept of good health, suggesting that it is necessary to examine aspects of daily life, such as general well-being and mental health, in addition to physical health. Healthy eating and physical activity are not just a “diet” or “program”; rather, they can be key contributors to health and well-being (Pilcher & Ott, 1998). Healthful habits, such as the incorporation of regular physical activity and a diet high in fruits and vegetables, make it possible to reduce the risk of many chronic diseases, such as heart disease, diabetes, osteoporosis, and certain cancers, and increase the chance of a longer life (Dawson et al., 2007; Pilcher & Ott, 1998).
**Justification and Assumptions**

Due to the nature of this research, the documented results may be applied to a variety of fields, such as nutrition, psychology, and the social sciences. College students are at a vulnerable time in their lives, as they have less parental control and more freedom to make their own lifestyle choices. College students are also regarded as nutritionally vulnerable because their diets are often low in energy and high in fat (Franciscy et al., 2004). This study may be beneficial not only to practitioners but also to the general population and, in particular, to college students. The research may be used to implement nutrition programs in the colleges as well as help practitioners understand the underlying reasons that motivate college students' eating habits.

More research is needed to gain a clearer understanding and to investigate whether there are correlations between nutrition knowledge, dietary self-efficacy, and dietary behavior. There are also limited, if any, reported studies that have investigated nutrition knowledge and dietary self-efficacy particularly in reference to college students. However, no documented studies have combined an examination of nutrition knowledge and dietary self-efficacy using BMI as the measure.

The research questions asked in this study are scientific. All variables and theoretical frameworks have been measured. The study was feasible because it was implemented in a reasonable amount of time at a reasonable cost. The participants were accessible and the proposed sample size was sufficient to conduct the analysis. Lastly, the study implemented procedures to protect the rights of its human subjects.
Delimitations and Scope

The target population consists entirely of college students residing in the United States, but the online nature of the survey limited the interaction between researcher and participants as well as the opportunity for asking questions and engaging in open communication. All participants self-reported their height and weight, which may have led to possible bias and unreliability. This study focused on normal and overweight groups, this was a limitation because it eliminates two groups (underweight and obese) from the population, which in turn affected the generalizability of the study. Using BMI as an indicator of nutrition knowledge and dietary self-efficacy also represented a limitation, as BMI reflects weight relative to height.

Chapter 1 provided an overview of the study, addressing health beliefs, lifestyle behaviors, nutrition, health, and well-being of college students. This introduction included the background and purpose of this study of the differences in the BMIs of college students according to their personal characteristics, nutrition knowledge, and dietary self-efficacy. Both theoretical and operational definitions of terms were presented for each of the study variables. The justification for the study was identified, and this study was deemed significant, researchable, and feasible. The delimitations and scope as they apply to the sample of college students were listed.

Chapter 2 provided an in-depth literature review and theoretical framework, anticipating the proposed research questions and research hypotheses addressed in this study. A critical analysis of theoretical and empirical literature regarding health beliefs, lifestyle behaviors, nutrition, health, and well-being of college students was presented. Finally, the research questions were presented in chapter 2.
Chapter 3 presented the research methodology, which consisted of the research design, population, sampling, survey instruments, data analysis procedures, ethical considerations, method of data analysis, and, finally, the evaluation of the research methodology. Chapter 4 described the findings of the study, including the results of research hypotheses testing, while chapter 5 presented interpretations of the results. Chapter 5 also concluded with a summary and interpretations of the findings followed by the practical implications, conclusions, limitations, and recommendations for future study.
Chapter 2: Literature Review, Theoretical Framework, Research Questions, and Research Hypotheses

Introduction to Literature Review

The literature review critically analyzes and reviews theoretical and empirical literature pertaining to lifestyle behavior and its effects, primarily on college students' health. National health objectives and recommendations have been reviewed, including *Healthy People 2010*, *Healthy Campus 2010*, Dietary Guidelines for Americans (DGA), the Food Guide Pyramid, and Recommended Dietary Allowance (RDA). Multiple factors that influence lifestyle behaviors of college students, such as gender, race, age, economic status, social and cultural norms, access to food, influence of peers and family, education, marital status, employment status, religious beliefs, frequency of physical activity, and available free time, have been explored. Populations included in the review range from 18 to 29 years old, the primary age range of college students.

The literature review has gone further to examine and discusses studies that have documented lifestyle behaviors, such as alcohol consumption, eating pattern, food choices, and physical activity displayed by college students (Anding et al., 2001; Dawson et al., 2007; Huang et al., 2003). It also examines their relationship and how these lifestyle behaviors have affected their nutrition status and overall health. The literature review also discusses the availability and accessibility of nutrition education programs, health and wellness programs, and exercise programs for college students. College students' food choices and eating patterns are determined according to different social and environmental influences, and so the literature review focuses on key theories,
namely the Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Social Cognitive Theory (SCT), and the Health Behavior Model (HBM).

The literature review extends to the discipline of psychology, health science, nutrition, sociology, and education. It covers the period from 1967 through present and focuses primarily on United States literature but includes some references to studies from Canada and the United Kingdom. The gaps and weaknesses have been identified through a critical analysis process. Finally, the literature review proposed further areas for scholarly inquiry, establishes a theoretical basis for the study, and developed research questions and research hypotheses to be examined.

**Lifestyle Behaviors of College Students**

Lifestyle behaviors are dependent on and created through history, culture, and environment. Lifestyle behaviors can also be influenced by family, friends, and beliefs (Jackson, Tucker & Herman, 2007). These genetic, environmental, behavioral, and cultural factors can affect the daily choices that are made, which may in turn have implications for an individual’s future health. As Hendricks and Herbold (1998) explain, “Epidemiologic, clinical, and basic research has established that diet and lifestyle play a significant role in the etiology and pathogenesis’s of major chronic diseases in developed countries, and that modifying these risk factors can substantially decrease disease risk” (p. 68). Of the top ten leading causes of disease in the United States, four are related to diet, namely coronary heart disease, cancer, diabetes, and strokes. Several studies have indicated that many college students throughout the United States engage in unhealthy lifestyle behaviors that place them at risk for serious, acute, and chronic health problems.
Leenders, Shermman, & Ward, 2003). Some of these unhealthy lifestyle behaviors, such as poor nutrition choices, inactivity, alcohol consumption, and tobacco use, start in high school and tend to continue and increase throughout a student’s college years. Since these lifestyle factors play a predominant role in the mechanisms and processes that lead to the development of many chronic diseases in the United States, it is necessary for individuals to adopt and maintain lifestyles that include a healthy diet and regular physical activity (Aldana et al., 2006).

Lifestyle Behavior Theories

Several significant theories and models have been proposed to analyze and explain human behavior. Three levels are particularly related to health education: (a) Individual (Intrapersonal); (b) Interpersonal; and c) Community. This literature review describes three theories: the TRA, TPB, and SCT, and one model, the HBM. The TRA, TPB, SCT, and HBM explain health behavior and health behavior changes by focusing on the individual.

Theory of Reasoned Action (TRA). Fishbein (1967) introduced a theory to evaluate relationships between different types of beliefs (behavioral and normative), attitudes, intentions and behavior based on his effort to understand health behavior outcomes. The TRA has been applied in many areas of psychology and integrates learning theory, attitude theory, and decision making (Montano, Kasprzyk & Taplin, 1997). The TRA states that a persons’ behavior is determined by their attitude toward the outcome of that behavior and opinions about their social environment. To date, the TRA
has been used in several empirical studies to understand health behaviors and examine interventions (Ajzen & Driver, 1991; Glanz, & Rimer, 1997; Montano & Taplin, 1991).

The TRA is composed of four major constructs: behavioral belief, evaluation of behavioral outcomes, normative belief and motivation to comply. The TRA is a “causal chain that links behavioral beliefs, evaluation of behavioral outcomes, normative beliefs, and motivation to comply to behavior through attitudes and subjective norms” (Montano et al., 1997, p. 141). Behavior is the transmission of intention or perceived behavioral control into action. Behavioral belief is defined as the belief that behavioral performance is associated with certain attributes or outcomes. Behavioral intention is influenced by three components: a person’s attitude toward performing the behavior, perceived social pressure—called subjective norm—and perceived behavioral control. The major proposition is that behavioral performance is associated with certain attributes or outcomes. Evaluation of behavioral outcomes involves the attachment of value to a behavioral outcome or attribute. Normative belief refers to a belief through which each referent either approves or disapproves of a behavior. A referent is defined as a person or thing to which a linguistic expression refers. Motivation to comply is each referent's motivation to do what each he or she believes. Behavioral intention refers to the perceived likelihood that a referent will perform a behavior (Ajzen, 1991; Ajzen & Driver, 1991).

Attitudes and subjective norms are measured using a Likert scale with phrases that can be evaluated using terms such as like/unlike, good/bad, and agree/disagree. The intent to perform a behavior depends upon the product of the measures of attitude and subjective norm. A positive product indicates behavioral intent (Glanz et al., 1997). TRA
works best when applied to behaviors that are under a person's volitional control. If behaviors are not fully under volitional control, even though a person may be highly motivated by her own attitude and subjective norm, she may not be able to perform the behavior due to intervening environmental conditions.

Fishbein and Ajzen (1967) developed a schematic model depicting the direct relationship between concepts relevant to the TRA. Their major proposition was that behavioral intentions are a function of two different factors. The first factor is attitude toward the behavior, which Chang defined as the “product of one's salient belief that performing the behavior will lead to certain outcomes, and an evaluation of the outcomes which is the rating of the desirability of the outcome” (Chang, 1998, p. 1826). The second factor is subjective norm, which is “a function of the product of one's normative belief which is the person's belief that the salient referent thinks he should (or should not) perform the behavior, and his/her motivation to comply to that referent” (Chang, 1998, p. 1827). Ultimately, the TRA states that people’s behavior is predicted by their attitude toward a particular behavior and their assumptions about how other people will view them if they perform the actual behavior. Both of those factors determine a person's behavior intention, which determines whether a behavior is performed or not. The following schematic model displayed in Figure 2.1 illustrates the TRA.
The TRA has been applied to many different situations that have supported the theory's basis. The TRA has been used in several empirical studies (Ajzen & Driver, 1991; Glanz, & Rimer, 1997; Montano & Taplin, 1991), and it has been deemed socially significant for addressing essential issues about determined behavior in the discipline of psychology. It is also useful for explaining the relationship between those with positive and negative behavioral outcomes. A Study by Ajzen et al. (1980) verify the propositions regarding normative belief and motivation to comply, providing further empirical validity to this theory. The TRA has been proven successful in predicting behavior in areas such as weight reduction, family planning, brand choices, voting in American presidential elections, use of public transportation, reenlistment in military organizations, and blood donations (Glanz, 2002).
One limitation of the theory comes from the nature of the self-reporting used to determine people's attitudes. No direct observation is used in the application of this theory; only self-reported information is used. Self-reported data is not necessarily always accurate. In order to predict specific behavior, attitudes, and intention, the TRA must be in agreement on action, target, context, and time. The greatest limitation of the theory stems from the assumption that behavior is under volitional control. That is, the theory only applies to behavior that is consciously thought out in advance. Irrational decisions, habitual actions, or any behavior that is not consciously considered cannot be explained by this theory. Another limitation of the TRA is that it must be applied in conjunction with other theories and models, such as the Self-Regulation Theory (Leventhal & Cameron, 1987) or Protection Motivation Theory (Rogers & Mewborn, 1976) to explain behavior precisely. Even though the TRA does not successfully predict all behavior, it has been found to fit more situations than those for which it was first developed (Cuerrier, Deshaies, Vallerand, & Pelletier, 1992).

Some of the laboratory studies in which the TRA has been tested have been in the areas of dental hygiene, education, contraceptive behavior, smoking, cervical and testicular cancer examinations, blood donation, seat-belt use, and voting behavior. (Cuerrier et al., 1992). The TRA has been useful in the development of interventions now being implemented in the Group Health Cooperative (GHC) of Puget Sound breast cancer screening program (Thompson, Taplin, Carter & Schniter, 1989). A competing theory is SCT, which states that individuals derive an enhanced sense of self-efficacy or confidence regarding their health behavior through specific mechanisms (Glanz, 2002).
Both the TRA and the social cognitive theory represent dominant theories of health education, health promotion, and health behavior.

Theory of Planned Behavior (TPB). For approximately the past 20 years, Ajzen and colleagues (Ajzen, 1991; Ajzen & Driver, 1991) have revised and added perceived behavioral control to the TRA in an effort to account for factors outside the individual’s control. The TPB is considered an extension of the TRA. Ajzen et al. (1991) proposed the extension of the TRA after determining that behavior was not 100% voluntary and under control. Thus, the construct perceived behavioral control was added to account for factors outside an individual’s control that may affect intention and behavior, resulting in the TPB (Glanz et al., 2002). The extension was based on the concept that behavioral performance is determined by motivation (intention) and ability (behavioral control). It is theorized that an individual will put forward more effort to perform a behavior when they perceive their behavioral control as being high (Glanz & Rimer, 1997).

Ajzen’s model defined behavior as a person’s intention to perform it along with measured intention, attitude, subjective norm, and perceived behavioral control. The theory proposes that perceived control is an independent determinant. This theory predicts deliberate behavior, as that behavior can be planned. The TPB has been applied in many areas of psychology and is said to be one of the most predictive persuasion theories (Ajzen, 1991). The TPB has also been used in several empirical studies throughout the years to integrate relationships among beliefs, attitudes, behavioral intentions, and behaviors in various fields, such as advertising, public relations, campaigns, and healthcare (Glanz & Rimer, 1997).
This theory introduced two additional major constructs (*control belief* and *perceived power*) to the existing four constructs presented in the TRA. This resulted in six constructs, identified as behavioral belief, evaluation of behavioral outcomes, normative belief, and motivation to comply, and the additional control belief and perceived power. These constructs are defined as follows: behavioral belief is the belief that behavioral performance is associated with certain attributes or outcomes; evaluation of behavioral outcomes is the value attached to a behavioral outcome or attribute; normative belief is a belief about whether each referent approves or disapproves of a given behavior; motivation to comply is each referent’s motivation to do what he or she believes should be done; behavioral intention is the perceived likelihood that a referent will perform a behavior; control belief is the perceived likelihood of the occurrence of each facilitating or constraining condition; and perceived power is the perceived effect of each condition on the difficulty of behavioral performance (Glanz et al., 2002).

Ajzen (1991) developed a schematic model that depicted this direct relationship between concepts related to the TPB (Ajzen, 1991; Ajzen & Driver, 1991; Ajzen & Fishbein, 1980). According to the TPB, behavioral intention is influenced by three components: a person’s attitude toward performing the behavior, perceived social pressure which can also be called subjective norm, and perceived behavioral control. The following schematic model displayed in Figure 2.2 illustrates the TPB.
The major proposition of this theory is that "perceived control is determined by control beliefs concerning the presence or absence of resources for and impediments to behavioral control, weighed by the perceived power or impact of each resource and impediments to facilitate or inhibit the behavior" (Glanz et al., 1997, p. 92). Studies by Terry, Gallosis, and McCamish (1993) and Ajzen (1991) verify the propositions regarding control beliefs, providing empirical validity to this theory. The TPB is a well-
developed theory useful for determining both behaviors and intention. However, most studies have used a single measure of perceived control rather than calculating perceived control from measures of control beliefs and perceived power. Practitioners who develop intervention programs and target environmental factors and populations for which control beliefs are most strongly associated with intentions and behaviors have used the TPB.

Substantial empirical evidence supports the theory's validity and reliability for the prediction of health behaviors. Ajzen (1991) established the predictive validity of TPB by comparing multiple correlations between intentions and perceived behavioral control from different studies dealing with a range of activities, from playing video games to losing weight, cheating, shoplifting, or lying. A range from 0.20 to 0.78 in multiple correlations was significant in predicting behavior. The TPB has been used in several empirical studies to determine the behavioral intent (Ajzen, 1991; Ajzen & Driver, 1991; Glanz et al., 1997).

Ajzen's construct of perceived behavioral control is similar to Bandura's (1991) construct of self-efficacy, defined as "an individual's judgment of how well he can perform a behavior under various inhibiting conditions" (Bandura, 1991, p. 110). In comparing both theories, it becomes evident that the measures of the constructs are somewhat different from that of the TPB. The construct of perceived control is also very similar to Triandis's concept of facilitating conditions (1980), which refers to characteristics of an individual, such as knowledge, ability, or environmental conditions, that make it easier or more difficult to perform a behavior independent of an individual's behavioral intention. Ajzen (1991) has found gaps in the relationships described by his framework and suggested further study in this area. The TPB has been useful in the
development of interventions, prediction of condom use among high-risk groups, and prediction of mammography use (Glanz et al., 1997). It has also been used in nutrition and health studies, especially those applicable to health education. The TPB is used to predict and understand healthy and unhealthy behavior (e.g., choosing French fries or fresh fruit) and the outcomes of such behavior. It has important implications for health education in examining health-related behaviors and implementing and developing health prevention programs. It is also used to predict and understand intentions, behaviors, and outcomes of health-related behaviors, including weight loss, alcohol abuse, smoking behavior, and physical activity. A competing theory is social cognitive theory, which states that individuals derive an enhanced sense of self-efficacy or confidence regarding their health behavior through specific mechanisms (Glanz, 1997). The TPB, TRA and the SCT are all prominent and useful approaches to health education, health promotion, and health behavior.

**Social Cognitive Theory (SCT).** Miller and Dollard (1941) proposed a theory of social learning. Bandura and Walters (1963) further broadened this social learning theory with principles that examined human behavior as an interaction of personal factors, behavior, and the environment (Bandura, 1991; Bandura, 2002). The SCT (1986) explains how people acquire and maintain certain behavioral patterns, while also providing the basis for intervention strategies aimed at changes in health behavior (Bandura, 1997). Over the last 20 years, the SCT has been revised and now proposes that the primary construct for influencing behavior and social change is perceived self-efficacy. The SCT has been applied in many areas of psychology for the purpose of understanding, predicting, and changing human behavior. The SCT has also proven
relevant to facilitating new behavioral research in health communication and education. It has been used in several empirical studies by Luszczynska, Scholz, and Schwarzer (2005), Petosa, Suminski, and Hertz (2003), and others throughout the years in order to provide frameworks for designing, implementing, and evaluating programs (Glanz et al., 1997; Luszczynska et al., 2005; Petosa et al., 2003).

This theory identifies several constructs, which include *environment*, *situation*, *behavioral capability*, *expectations*, *expectancies*, *self-control*, *observational learning*, *reinforcements*, *self-efficacy*, *emotional coping responses*, and *reciprocal determinism*. The constructs are defined as follows: environment includes factors physically external to the person and provides opportunities and social support; situation refers to perceptions of the environment and the correcting of misperceptions in order to promote healthful norms; behavioral capability is the knowledge to perform a given behavior and mastery achieved through skills training; expectations are the anticipated outcomes of a behavior that model positive outcomes for healthful behavior; expectancies represent the values that a person places on given outcomes, incentives, and functional outcomes leading to change; self-control refers to the personal regulation of goal-directed behavior or performance that provides opportunities for self-monitoring, goal setting, problem solving, and self-reward; observational learning is the behavioral acquisition that occurs through observing the actions and outcomes of others’ behavior, including credible role models for the targeted behavior; reinforcements are the responses to a person’s behavior that increase or decrease the likelihood of a behavior’s reoccurrence and promote self-initiated rewards and incentives; self-efficacy is a person’s confidence to perform a particular behavior, approach behavioral change through small steps to ensure success,
and seek specificity in the changes sought; emotional coping responses include strategies or tactics used by a person to deal with emotional stimuli and provide training in problem solving and stress management, including opportunities to practice skills in emotionally arousing situations; reciprocal determinism refers to dynamic interaction between a person, a behavior, and the environment in which a behavior is performed and takes into account multiple avenues to behavioral change, including environmental, skills-related, and personal change-related avenues (Glanz et al., 1997).

The major proposition of this theory is that evaluation of behavioral changes depends on the factors of environment, people, and behavior that are constantly interacting and affecting each other. The environment, which can be categorized as social and physical, can affect a person’s behavior. The social environment consists of family members, friends, colleagues, and physical environment, which can be a place of study, work, temperature of a room, or the availability of certain foods. The first proposition of SCT is that interaction between a person and behavior influences a person’s thoughts and actions. The second proposition is that interaction occurs between a person and their environment and it is affected by human beliefs and cognitive competencies tailored by environment and social influences and structures. The last proposition is that a relationship exists between environment and behavior, and this relationship encompasses a person’s behavior determinants and aspects of their environment which modify their behavior (Glanz et al., 2002). Bandura (1967) developed a schematic model depicting these direct relationships among concepts included in the SCT, which continues to be examined today (Glanz et al., 1997). The following Figure 2.3 shows the schematic model displayed that illustrates the functions of the SCT.
Substantial empirical evidence supports the empirical validity of SCT in predicting health behaviors. Empirical studies have focused on relationships between the SCT constructs and domains specific to self-efficacy (Luszczynska et al., 2005; Petosa, Suminski & Hertz, 2003). The SCT is socially significant for addressing essential issues about determined behavior in the discipline of psychology, and is useful in explaining relationships among those with positive and negative behavioral outcomes. The SCT is also a well-developed theory for determining and predicting behavior; however, health educators and behavioral scientists disagree on issues of complexity versus parsimony, and believe the theory may be too comprehensive in its formulation. Domel criticized the theory, implying that more attention needs to be paid to nonlinear aspects of the SCT.
(e.g., self-efficacy should predict behavior primarily when expectations for positive outcomes are high) (Domel, 1994). Such interactive terms have not usually been tested through empirical studies. Several large, funded intervention studies have been designed using SCT constructs but have not resulted in changed behaviors (Carleton, 1995; Fortmann, 1993; Luepker, 1994). Although the lack of effective outcomes could be due to the inadequacy of the theory, it could also be due to contamination between control groups, intervention problems, or research designs.

The SCT has been particularly useful in the development of interventions programs now being implemented in Project Northland's *Amazing Alternatives*, to prevent alcohol use in adolescents (Perry, 1993; Williams, 1995). The SCT has also been used in the development of the program *Gimme 5 Fruit, Juice and Vegetables for Fun and Health*, designed to increase the availability and accessibility of fruits and vegetables for children (Dormel, 1994). It has been used in nutrition and health studies and the self-efficacy construct, part of Bandura's SCT, has been used to understand behavior related to many components of the diabetes self-care regimen (Allen, 2004). The SCT is an effective model from which to explore influential constructs of health behavior. Several studies have demonstrated how nutrition interventions can be effective by using the SCT to significantly improve dietary self-efficacy among different populations, such as urban Native American people, both for children and adolescents (Rinderknecht & Smith, 2003). A study conducted by McKinley Health Center at University of Illinois in Urbana used the SCT in a community-based diabetes education intervention. The study was titled *The improvement in knowledge, social cognitive theory variables, and movement through stages of change after a community-based diabetes education program*. The results
reflected positive impacts on knowledge, health beliefs, and self-reported behaviors. The study concluded that improvement in knowledge through the implementation of the SCT can be instrumental in moving individuals toward an action or maintenance stage and improving self-efficacy (Chapman-Novakofskik & Karduck, 2005).

Competing theories include the TPB, which states that behavioral performance is determined by motivation (intention) and ability (behavioral control) and the TRA, which states that relationships between different types of beliefs (behavioral and normative), attitudes, and intentions are applicable to understanding health behavior outcomes (Ajzen, 1991).

Health Belief Model (HBM). Hochbaum, Rosenstock, and Kegels (1950) introduced a model of health behavior based on attitudes and beliefs of individuals. Their model, the HBM, was developed in response to the failure of tuberculosis (TB) health screening programs. The HBM identifies four major constructs, representing perceived threats and net benefits: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. In 1998, the concepts of cues to action and self-efficacy were adapted to the model by Rosenstock (1974) to make the HBM better suited to the challenge of changing unhealthy behaviors. These constructs served to project an individual’s readiness to act. They are defined as follows: perceived susceptibility refers to one’s opinion regarding the chances of contracting a condition, perceived severity refers to one’s opinion regarding how serious a condition and its sequelae may be, perceived benefits refer to one’s opinion of the efficacy of an advised action for reduce risk or seriousness of impact, perceived barriers refer to one’s opinion of the tangible psychological costs of an advised action, cues to action refers to strategies to activate
one’s “readiness,” and self-efficacy refers to one’s confidence in one’s ability to take action (Glanz et al., 1997). A schematic model for the HBM was created to reflect all the major constructs (Glanz et al., 1997). The following schematic model displayed in Figure 2.3 illustrates these relationships of aspects of the HBM.

**Figure 2.4** “The health belief model” by Hochbaum, Rosenstock and Kegels, 1950. Copyright 1997 by Glanz, Lewis, and Rimer, *Health Behavior and Health Education, 2nd ed.*, p. 48. Reprinted with permission of the authors.
The model has been considered a value expected theory. Its major propositions are based on the understanding that a person will take health-related action if that person (a) feels that a negative health condition can be avoided; (b) has a positive expectation that, by taking a recommended action, he/she will avoid a negative health condition; and (c) believes that he/she can successfully take a recommended health action (Glanz et al., 2002).

According to Jette et al. (1981),

The concept of susceptibility refers to the perceived risk of contracting an illness; Severity refers to the degree of emotional arousal created by the thought of an illness as well as the difficulties the individual believes the illness would create and perceived susceptibility and severity have a strong cognitive component wherein knowledge, in part, leads to action. (p. 82)

As the above indicates, Jette et al. assumed the direction an action takes is influenced by beliefs regarding the relative effectiveness of available alternatives to reduce the threat of illness, and mitigated by beliefs regarding the negative aspects of health actions (inconvenience, expense, pain) that serve as barriers to the actions (Jette et al., 1981).

Measuring the HMB construct requires that researchers be familiar with the theory as well as the processes needed for operationalizing concepts relevant to measurement issues, because they closely relate to the cognitive factors that predispose a person toward a given health behavior. According to most social researchers, the HBM leaves much to understand regarding how factors enable and reinforce one's behavior. These factors are extremely important in instances where the model is used to explain and predict a more complex lifestyle behavior that needs to be maintained over a lifetime (Glanz et al., 1997). Four major measures of the HBM are presented (perceptions of
susceptibility, seriousness, barriers, and benefits). According to the scale development of
the HBM, even when valid and reliable measures are used, they must be validated by
each data collection because validity and reliability haven been shown to be sample-
specific and may change depending on sample characteristics.

One major implication of the model is the inconsistency of the measurement of
the concepts. Several cross-sectional studies by Rosenstock, Strecher, Janz, and Becker
(1984), failed to establish validity and reliability prior to model testing. Instruments to
measure the constructs of the model have been noted as difficult to implement: “A
systematic, quantitative review of studies that had applied the HBM among adults into
the late 1980s found it lacking in consistent predictive power for many behaviors,
probably because its scope is limited to predisposing factors” (Harrison, Mullen & Green,
1992, p. 112). One study that specifically compared its predictive power with other
models found that the HBM accounted for a smaller proportion of the variance in diet,
exercise, and smoking behaviors than did the TRA, TPB, and the PRECEDE-PROCEED
model (Mullen, Hersey, & Iverson, 1987). These are among the concepts about the theory
that continue to be examined today (Janz & Becker, 1984).

This theory is socially significant, addressing essential issues about screening and
compliance, and, in more recent literature, the model has been used in research and as an
intervention tool with a broad spectrum within health related disciplines, psychology,
family medicine, nutrition, clinical prevention programs, and behavioral programs. Thus,
it is a well-developed guide to perceived benefits, barriers, and behavior change. The
model is somewhat complex because measuring its concepts has proven challenging for
researchers; however, its usefulness is prominent throughout programs in a variety of
fields. Studies by Rosenstock, Strecher, Janz, and Becker (1984) verify the propositions of susceptibility, seriousness, benefits, and barriers, providing empirical validity to this model (Glanz, 1997).

The most useful proposition of the HBM is the affect of perceived barriers, presented across all empirical studies on behavior conducted between 1974 and 1984 (Glanz, 1997). The HBM has been adapted in areas of preventive health behaviors, health promotion (diet and exercise), health risk behaviors (smoking), sick role behaviors (HIV), and compliance with recommended medical regimes (vaccinations and contraceptives), and is used by physicians' clinics, hospitals, and health and wellness centers for a variety of reasons (Conner & Norman, 1996). This was the predominant theory used by Hochbaum to examine TB screening programs in 1958 and, more recently, to examine HIV patients and smoking cessation programs. Competing theories include the Protection Motivation Theory (Roger, 1975), which proposes that the most persuasive communications are those aroused by fear, severity of an event, and the self-efficacy of the response to a threat (Glanz et al., 2002).

The HBM has two weaknesses; the first is that health beliefs compete with an individual's other beliefs and the second is that attitudes can also influence behavior. Through research in social psychology, the HBM has also shown that belief formation always precedes behavioral change. In fact, the formation of a belief may actually follow a behavior change. Even though the HBM was originally developed to help explain certain health related behaviors, it has also helped guide the search for "why" these behaviors occur and identify points for possible change. The HBM is used in research studies to persuade individuals through health education to make a healthy decision.
regarding hypertension, eating disorders, contraceptive use, and breast self-examination. It is thus a very valuable guide for practitioners planning the communication component of health education programs.

**Lifestyle Behavior Measurements**

Most prominent health behavior theories include self-efficacy or similar constructs. Self-efficacy is a proximal and direct predictor of intention and of behavior according to the SCT (Bandura, 1997). General self-efficacy “is the belief in one's competence to cope with a broad range of stressful or challenging demands, whereas specific self-efficacy is constrained to a particular task at hand” (Luszczynska et al., 2005, p. 439). Self-efficacy pertains to a sense of control over one's environment and behavior. Self-efficacy beliefs are cognitions that determine whether health behavior change will be initiated, how much effort will be expended, and how long this effort will be sustained in the face of obstacles and failures (Luszczynska et al., 2005). Thus, self-efficacy is directly related to health behavior, but also affects health behaviors indirectly through its impact on goals (Glanz et al., 2002).

**General Self-Efficacy Scale (GSE).** The General Self-Efficacy Scale (GSE) was originally developed in Germany by Matthias Jerusalem and Ralf Schwarzer in 1979, and has been translated into 28 languages (Luszczynska et al., 2005). Bilingual speakers adapted self-efficacy items to foreign languages based on the German and English versions of the GSE scale (Luszczynska et al., 2005). The scale was originally designed for the adult population, including teenagers, in order to assess a general sense of
perceived self-efficacy and predict people’s to adapt to and cope with daily life after experiencing stressful life events.

The GSE scale includes 10 items. The scale is based on a four point rating scale, and the response format is as follows: 1 indicates not at all true, 2 indicates hardly true, 3 indicates moderately true, and 4 indicates exactly true, resulting in a potential total score that ranges between 10 and 40. Higher scores are associated with greater self-efficacy. The scale is unidimensional. Examples of the type of statements used are, “I can solve most problems if I invest the necessary effort” or “I can usually handle whatever comes my way” (Luszczynska et al., 2005).

Reliability has been estimated, and the construct validity of the GSE scale has been established in numerous studies. For internal consistency reliability, Cronbach’s alphas ranged from 0.76 to 0.90, with the majority of the scores in the high 0.80s (Luszczynska et al., 2005). The scale was found equivalent across studies in 28 nations that used parallel forms in different languages.

Convergent validity was evident where correlations between general self-efficacy and positive emotions, such as happiness, dispositional optimism, and work satisfaction, were reported. Negative coefficients were found in relation to depression, anxiety, stress, burnout, and health complaints (Leganger, Kraft & Røysamb, 2000; Schwarzer & Renner, 2000). Explanatory factor analysis to establish construct validity revealed one factor resulting in a unidimensional scale.

The GSE scale has been used in several disciplines throughout the world with repeated success for the past 20 years. It has been implemented in several empirical studies to predict and indicate an individual’s quality of life at any point in time.
However, a limitation of the scale is that it does not target specific behavior change. It is necessary for researchers to add items to compensate for the particular content of a survey or intervention (such as nutrition self-efficacy added to physical exercise self-efficacy) (Luszczynska et al., 2005). The GSE measures refer to the ability to deal with a variety of stressful situations. Measures of self-efficacy for health behaviors refer to beliefs about one’s ability to perform certain health behaviors. These behaviors may be defined broadly—for instance, confidence of clients in intervention programs (i.e., healthy food consumption)—or in a narrow way (i.e., consumption of high-fiber food). Nutrition-related or dietary self-efficacy can be used in the area of dieting, weight control, and preventive nutrition, reflected by nutrition self-efficacy beliefs. It has been found that nutrition self-efficacy operates best in concert with general changes in lifestyle, including physical exercise and the establishment of social support.

**Dietary Self-Efficacy Scale.** Dietary self-efficacy will be measured utilizing the Dietary Confidence Survey (Sallis et al., 1988). The Dietary Confidence Survey is a 20-item survey developed to measure the degree to which subjects are sure they can make dietary behavior changes. The scale measures self-efficacy for health-related behaviors, primarily including diet and exercise behaviors. The survey is based on a five-point rating scale. Respondents rate the importance or accuracy of the reasons behind their eating habits using a five-point semantic differential scale with anchor ratings of 1, which equals “I know I cannot,” to 7, which equals “I know I can.” The code designates the rating of 8 and blanks as “missing values.” The four factors for dietary self-efficacy are scored based on the following: sticking to it, mean items 1 to 5; reducing calories, mean items 6 to 10; reducing salt: mean items 11 to 15; reducing fat: mean items 16 to 20. Higher scores
reflect greater importance for sticking to the behavior (Sallis et al., 1988). Internal consistency reliability coefficients range from 0.83 to 0.85. Additionally, test-retest reliability for the dietary and exercise confidence survey has been determined to be adequate (Sallis, Pinski, & Grossman, 1988).

**Developmental Task and Lifestyle Assessment (DTLA).** Developmental Task and Lifestyle Assessment (DTLA) is a modification of the Student Developmental Task and Lifestyle Inventory (SDTLI), which was originally created by Winston, Miller, and Prince in 1987. The SDTLI scale measures the degree to which a student's lifestyle is consistent with or promotes good health and wellness practices. Acquiring a high score is associated with maintaining healthy lifestyle practices, including eating well-balanced, nutritious meals, maintaining an appropriate body weight, planning for and obtaining sufficient amounts of sleep and physical exercise, using effective stress reduction techniques, and positively evaluating one's physical appearance. The scale was designed to detect and measure certain behavioral characteristics, attitudes, or feelings of young adults, particularly college students between the ages of 17 and 25.

The DTLA is composed of developmental tasks, subtasks, and subscales. According to the DTLA, a scale developmental task is defined as an interrelated set of behaviors and attitudes that the culture specifies should be exhibited at approximately the same time by a given age cohort in a designated context (Chickering & Reisser, 1993; Havighurst, 1972; Kitchener, 1982; Mines, 1982). As Chickering and Reisser (1993) asserted, “Successful accomplishment or achievement of a developmental task allows the individual to acquire the experiential based need to accomplish future developmental tasks” (p. 96). In contrast, “Failure to meet the challenges inherent in the developmental
task area results in social disapproval and/or may hinder further development in the area or can lead to personal adjustment problems” (p. 97).

The scale contains items describing activities, attitudes, and feelings and is designed to identify the bias of responses. Students respond to each statement by determining whether it is basically an accurate description (true) or an inaccurate description (false) of them. Sample true-false and multiple choice questions are as follows:

I have personal habits that are potentially dangerous for my health.
A. True
B. False

I plan my activities to make sure that I have adequate time for sleep.
A. Never (almost never) true of me.
B. Seldom true of me.
C. Usually true of me.
D. Always (almost always) true of me.

The SDTLI instrument has been widely used in several empirical studies and the established reliability and validity of its estimates is directly supported by Niles, Sowa, and Laden (1994), Hunt and Rentz (1994), and Cooper, Healy, and Simpson (1994).

**Theory of Reasoned Action (TRA) Scale.** The TRA uses a semantic differential scale that measures each construct using item responses, the poles of which are anchored in different terms. The response categories and measurements are as follows: behavioral intention (bipolar unlikely-likely scale; scored -3 to +3), behavioral belief (bipolar unlikely-likely scale; scored -3 to +3), evaluation of behavioral outcomes (bipolar bad-good scale; scored -3 to +3), normative belief (bipolar disagree-agree scale; scored -3 to +3), motivation to comply (bipolar unlikely-likely scale; scored 1 to 7) (Fishbein & Ajzen, 1980).
In the TRA and TPB, behavioral intention is assumed to be an indicator of the motivational factors that influence a behavior (Ajzen, 1991). When using a semantic differential scale to measure intention, the higher the score on the scale or the stronger the intention, the more likely the individual will perform the behavior. Attitudes toward the behavior are made up of beliefs about engaging in the behavior and the associated evaluation of those beliefs. Each belief is then rated to determine the likelihood that engaging in a given behavior will produce the expected consequence. The likelihood ratings are an index of belief strength. After subjects rate the probability of each belief’s truthfulness, they evaluate how good or bad this result is. These ratings (both belief strength and evaluations) are quantified on scales ranging from -3 to +3 or 1 to 7. The belief strength and evaluation ratings are multiplied together for each belief and added across beliefs to obtain a measure of attitude toward the behavior. Intention is determined by three conceptually distinct variables: attitudes toward behavior, subjective norms, and perceived behavioral control (Glanz, 2002). Intention is usually measured using a semantic differential scale where one to four questions are asked of the likelihood of the respondent to engage in the behavior. A recent met-analysis (Sheppard, Harwick, & Warshaw, 1988) found the mean correlation between intention and the attitudes plus norm component to be 0.66. The subjective norm term in the model is also multiplicative. The “b’s” in this term are beliefs about what relevant others will think if the respondent engages in the behavior. Each belief receives a second rating measuring how strongly the respondent wishes to comply with views of others (Schifter & Ajzen, 1985). The TRA applies to the predictions of intentions, rather than the behavior itself. The TRA also states that, if behavior is under volitional control, then the intention to perform an action
will correlate highly with the action itself. Correlations between intention and behavior averaged 0.55 (Schifter & Ajzen, 1985).

**Theory of Planned Behavior (TPB) Scale.** The TPB is measured on a semantic differential scale anchored in different terms for the poles for each construct. Terms are evaluated and measured on bipolar “unlikely-likely” or “disagree-agree” scales. The response categories and measurements are as follows: behavioral intention (bipolar unlikely-likely scale; scored -3 to +3), behavioral belief (bipolar unlikely-likely scale; scored -3 to +3), evaluation of behavioral outcomes (bipolar bad-good scale; scored -3 to +3), normative belief (bipolar disagree-agree scale; scored -3 to +3), motivation to comply (bipolar unlikely-likely scale; scored 1 to 7), control belief (bipolar likelihood-of-occurrence scale; scored 3 to +3), and perceived power (bipolar “easy-difficult” scale; scored -3 to +3). The measure received by these factors ultimately determines the facilitation or impediment of a behavior (Fishbein & Azjen, 1980).

When the TPB reflects a higher score on the scale, indicating stronger intention, the more likely it is an individual will perform the behavior. Intention is also determined by three conceptually distinct variables, as in the TRA: attitudes toward behavior, subjective norms, and perceived behavioral control (Glanz, 2006). Perceived behavioral control refers to the perceived ease or difficulty associated with the execution of future behavior (Glanz, 2002). The stronger the belief or perceived behavioral control, the more likely it is that the individual will behave in a way that directly reflects the performed behavior. Attitudes reflect a summary evaluation of a given behavior captured in evaluative dimensions such as good-bad, harmful-beneficial, pleasant-unpleasant (Ajzen & Fishbein, 1980). A positive summary evaluation reflects a more positive attitude,
which would increase the likelihood of a desired behavior. Subjective norms reflect the perceived social pressure individuals may feel to perform or not perform a given behavior. A lower score indicates the least amount social pressure individuals may feel to perform or not perform a given behavior and may increase the likelihood of the desired behavior.

Strong evidence has supported the overall validity of intentions for predicting behavior. Several studies such as Armitage and Conner (2001) and Hagger, Chatzisarantis, and Biddle (2002) test the theory and have shown that attitudes and perceived behavioral control influence intentions and behavior. Hagger et al. (2002) conducted a meta-analysis indicating the effects (beta coefficients) of attitudes and perceived control. Hagger, Chatzisarantis, and Biddle (2002) estimated these coefficients to be 0.20 and 0.28, respectively (Hagger et al., 2002).

**Lifestyle Behaviors of College Students: Empirical Studies**

Jackson, Tucker, and Herman (2007) conducted a study with college students, exploring the roles of health values, social supports, such as family and friends, and self-efficacy in health-promoting lifestyles. They used a cross-sectional exploratory (comparative) and explanatory (correlation) research design. College students were recruited from two introductory psychology classes in the southeastern part of the United States. Their literature review was thorough, presenting research dating from 1972 though 2002, and informative in comparing and contrasting health models, particularly the HBM and the Health Promotion Model proposed by Pender, which clarifies the multidimensional pattern of a health-promoting lifestyle. Empirical studies of the
variables guiding the decision-making and action phases for specific health behaviors of college students were examined, leading to the realization that few studies have been presented using Pender’s Health Promotion Model as a guide for research. This resulted in Jackson, Tucker, and Herman (2007) testing the proposition of social support as a modifying factor that may affect the decision-making stage and then the action phase that lead to engagement in health promoting behaviors.

A non-probability, convenience sampling plan resulted in self-selected final data, producing a sample of $n = 162$ out of 180 eligible respondents, a response rate of 90%. An assessment battery was carried out that consisted of the following instruments: a demographic questionnaire to obtain information on the subject’s gender, age, race, current academic level, and family income. The Multidimensional Support Scale was used to assess the frequency of the availability and adequacy of perceived social support from family and friends. Internal consistency reliability using coefficient alpha ranged from 0.81 to 0.9021. The Health Value Scale was used to assess the values placed on the importance of the different aspects of health, including fitness or good physical state, energy, endurance, maintenance of an appropriate weight, and opposition to disease. Internal consistency reliability was estimated at a coefficient alpha of 0.77.

The Self-Rated Abilities for Health Practices Scale measured health self-efficacy in regard to exercise, well-being, nutrition and general health practices. There was no mention of a subscale. Internal consistency reliability using coefficient alpha was estimated at 0.92. The Health-Promoting Lifestyle Profile II was used to measure the degree of engagement in health-promoting lifestyles along six dimensions (subscales): spiritual growth, health responsibility, physical activity, nutrition, interpersonal relations,
and stress management. Using Cronbach's alpha as an estimate of internal consistency reliability resulted in a total scale of 0.94, and subscale that ranged from 0.79 to 0.87. There was no mention of the validity of these questionnaires.

The Marlowe-Crowne Social Desirability Scale was used to measure the amount of variance in the data caused by the participants' desires to present themselves in a socially desirable manner. Reliability coefficients for the 20-item instrument were estimated as ranging from 0.78 to 0.83. Previous empirical studies with college students have used all the scales listed. Data collection procedures were clearly described, and the study was IRB-approved.

The comparative results revealed that social desirability significantly correlated with health-promoting lifestyle \((r = .28, n = 144, p < .01)\), perceived family/friends social support \((r = .17, n = 153, p < .05)\), and health self-efficacy \((r = .17, n = 153, p < .05)\). According to Jackson et al. (2007), “Correlation analyses revealed significant positive relations between that social the health-promoting lifestyle variables and levels of health value \((r = .51, n = 144, p < .01)\), perceived family/friends social support \((r = .35, n = 144, p < .01)\), and health self-efficacy \((r = .61, n = 144, p < .01)\)” (p. 73). The multivariate ANOVA was used to determine differences in the levels of value of health, perceived family/friends social support, self-efficacy, and engagement in health-promoting lifestyle, all in association with gender, age, family, income, or ethnicity. The test indicated that race and age had statistically significant main effects, at \(p < .05\), on the level of engagement in health-promoting lifestyle.

Findings indicated that “self variables, health self-efficacy and health value, were significant predictors of engagement in a health-promoting lifestyle among college
students, providing support for health-promoting interventions that empower college
students to make positive health decisions” (Jackson et al., 2007, p. 74). These variables
were analyzed using ANOVA with significance at $p < .01$ to determine the unique
contribution of three independent variables (health value, perceived family/friends social
support, and self-efficacy). A multivariate ANOVA with significance at $p < .05$ was
again used to determine the significant difference in the levels of the three variables in
association with gender, age, family income, or ethnicity.

Findings, which supported Pender's Health Promotion Model, indicated "that
engagement in health behavior is a function of the value attached to the outcome of good
health and personal beliefs" (Jackson et al., 2007, p. 74), e.g., self-efficacy. These
findings led the authors to develop the following conclusions: (1) new lifestyles and
experiences in college may lead to unhealthy behaviors; (2) colleges and universities may
be an ideal setting for intervention programs to promote healthy lifestyles; (3)
empowering and effective health promoting programs require research that target factors
contributing to health-promoting lifestyles of college students. Implications for practice
were that health professionals in the college environment can (1) provide outreach
education on health related topics to increase self-efficacy beliefs and (2) develop and
implement programs aimed at increasing health value. Limitations reported by Jackson et
al. were the small sample size and the fact that the sample was predominantly female
(70%) and Caucasian (68%). Jackson et al. (2007) developed the following
recommendations for future study: (1) explore different ethnic backgrounds and health
values, perceived social support and health self-efficacy; (2) examine the role of health
values in college students at different colleges and universities; (3) investigate the roles
of family or friend support as external social support influences; and (4) explore the role of health self-efficacy in college students who engage in unhealthy behaviors.

Internal validity strengths of the study by Jackson et al. 2007 included the examination of concepts in existing theoretical models. The explanatory (correlation) design was stronger than the exploratory and descriptive designs, and the statistics were of a high enough level to reveal an explanatory relationship between the two variables. Because the research design was not experimental, a threat to internal validity limited inference of causality. The researchers recommend that future studies use longitudinal designs, larger samples, and probability sampling. External validity was weak because the sample was limited to two classes at one university. Threats to external validity of the study were inherent in the non-probability sampling plan as well (which consisted of self-selected and convenience sampling).

Luquis, Garcia, and Ashford (2003) conducted a descriptive study of college students' perceptions of health behaviors. They used a non-experimental qualitative research design, with a convenience sample of forty undergraduate college students between the ages of 18 to 24 years old. Students were recruited from 12 sections of a wellness class at a northeastern metropolitan university. The Luquis et al. literature review only briefly compared and contrasted previous findings regarding college students' perceptions of their health behaviors. The questions guiding the interviews the researchers conducted were based on theory, and the study compares its results and findings to prior studies within the area of perception and individual behavior. Empirical studies were examined, leading to the question of why college students still engage in risky behavior despite the serious health conditions and consequences that can occur. The
researchers proposed that, by understanding college students’ perceptions of their behaviors and the relationships between behaviors, health educators may be better able to tailor health promotion activities and programs to this population effectively.

Forty undergraduate students between the ages of 18 and 24 years old participated in seven focus groups. A questionnaire developed by the principal author was used to measure (a) perceptions and concerns regarding personal health, (b) assumptions and beliefs concerning substance use, (c) beliefs and issues regarding sexuality, pregnancy, and the prevention of STDs. The questionnaires were used to guide the focus groups discussion, data collection procedures were clearly described, and the study was IRB-approved. Findings confirmed that college students continue to engage in unhealthy behaviors even though they remain concerned about the risks (Luquis et al., 2003). Students also acknowledged and believed that it was difficult to maintain a healthy lifestyle while in college because they found themselves in a transition period, behaving as they wished without thinking about long term consequences. The results also indicated that many students believed that, while in college, they were expected to engage in unhealthy lifestyle behaviors such as unhealthy eating and drinking, not exercising, smoking, and promiscuous sexual behaviors.

Luquis et al. reported that most of the participants were not very concerned about their personal health and believed that youth was on their side. Most participants also believed that it was part of the college experience to indulge in unhealthy lifestyle behaviors, such as excessive drinking, inadequate sleep, poor eating habits, and not exercising. The authors’ findings indicated that college students belief that the use and abuse of alcohol were harmless and part of a college experience. Eighty to ninety percent
of the participants were using some type of drug and such behaviors were considered socially accepted. Findings were “discussed with administration with recommendations to students concerns regarding the availability of healthy food and usage of recreational facilities and possibilities for improvement” (Luquis et al., 2003, p. 164).

These findings led Luquis et al. (2003) to develop the following conclusion: the unhealthy lifestyle behaviors displayed by these college students, such as poor eating habits and lack of physical activity, resulted from lack of access to campus facilities such as dining halls and recreational facilities, that support healthy behaviors. Implications for future practice included the suggestion that health educators not only advocate for appropriate services for students but also consider the time, location, type, and advertisement used to promote programs that encourage students to acquire healthy behaviors and change their lifestyles and promote changes to campus facilities. The strengths of the study reported by the authors included the method of data collection, which used focus groups to provide insight into the participant’s experiences, perceptions, concerns, beliefs, thoughts, and behaviors. It also allowed the participants the freedom to express their beliefs and ideas and discuss personal issues and other information they would normally not disclose. Limitations reported by Luquis et al. (2003) included a small sample size, and methodology used (focus groups) limited the generalization of the results to other populations. Internal validity was also weak because of the chosen research design and the small sample size. However, while the results were limited, the following recommendations and conclusions could be used in other areas of research and for future study, as well as by health educators working to develop suitable health promotion programs for college populations.
The strengths of the study's internal validity included a clearly defined procedure that would facilitate replication in future studies. However, one significant threat to internal validity the authors recognized was the inherent weakness of the research design. External validity was weakened by the fact that the sample was taken from wellness classes only on a single university campus and was non-random. Threats to external validity were also present in the sampling plan (self-selected and convenience). Another limitation to the study, which the authors also recognized, was that generalization to other populations is not suitable and the potential for misinterpretation of the results and biases may have occurred during data analysis. Future studies should use a larger sample size to acquire the results needed for qualitative research. A stronger research design could also be implemented by using a quantitative, explanatory (correlation) and exploratory (comparative) research design in future studies. Additionally, the sampling plan could be random and culled from variety of classes throughout a university.

Nutrition Status, Health Beliefs, and Behaviors of College Students

Lifestyle habits and health beliefs of college students are important because behaviors that begin in college may continue after graduation and can be related to national concerns, such as HIV/AIDS, obesity, and the overall health of the nation (Dzokoto et al., 2007). Findings from the 1995 National College Health Risk Behavior Survey (NCHRBS) suggest that many college students engage in risky behaviors, including binge drinking, cigarette smoking, drug abuse, and unsafe sexual practices that increase their likelihood of serious health problems (Luquis et al., 2003). A study by Zweig, Lindberg, and McGinley (2001) indicated that a single behavior can be influenced
by other health risk behaviors among college students and that there are interrelationships between many different behaviors (Zweig, Lindberg, & McGinley, 2001). The study also concluded that "college students’ perceptions, opinions and beliefs of health risk behaviors have an impact on the way they ultimately behave" (Zweig et al., 2001).

According to Knutson (2000), there are approximately 14 million students between the ages of 18 and 24 enrolled in U.S. colleges or universities (McAthur et al., 2002). Community settings most proximal to college students usually influence their food choices. These may include on-campus restaurants, cafeterias or food stands, fast food outlets, public restaurants, shopping malls, vending machines, and convenience stores. Such community setting and available food resources influence students’ dietary practices and food choices, which may ultimately influence their BMI and overall health.

Several empirical studies by Binger (1999), Hertzler, Webb, and Frary (1995), and Huang et al. (1994) have assessed the dietary pattern and nutritional health of college students throughout the years. Findings have consistently confirmed that college students have poor dietary habits and continue to make poor nutritional choices. According to research, college students’ diets reflect a pattern low in energy, fiber, calcium, iron, vitamin A, and caroteniods and high in fat (McAthur et al., 2002). In 1999, Binger found low consumption of fruits and vegetables among 743 college students (Binger, 1999). Conclusions have asserted that “these findings reflect poor food choices and suggest a need among college students for more nutrition education interventions about healthful eating” (McAthur et al., 2002, p. 36).

Researchers and health educators have proposed monitoring, assessing, and promoting dietary patterns among college students as essential. From a public health
standpoint, it is necessary to prevent new cases of chronic diseases, thus “improving the quality of life for millions of people and reducing the nation’s health care cost” (McAthur et al., 2002, p. 37).

**Measurement of Weight Status and Health**

**Healthy Eating Index (HEI).** The Healthy Eating Index (HEI) is a measure of diet quality that assesses conformance to federal dietary guidance. The U.S. Department of Agriculture (USDA) Center created the original HEI for Nutrition Policy and Promotion (CNPP) in 1995. The HEI was then revised in 2006 to reflect the 2005 DGA (USDA, Original Healthy Eating Index Reports, 2005). The HEI is used to measure diet quality in particular, and encompasses the types of foods people eat, the variety in their diets, and the degree to which their diets comply with the Federal Dietary guidelines (i.e., the specific recommendations of the DGA and the Food Guide Pyramid). The instrument can be used to assess how well Americans’ diets comply with the 2000 Dietary Guidelines for Americans and the Food Guide Pyramid.

The scale for the HEI is applied to the individuals’ diet, and each component of the index has a maximum score of 10 and a minimum of zero. Intermediate scores are computed proportionately. The maximum overall score for the 10 components combined is 100. High component scores indicate intake close to recommended ranges or amounts; low component scores indicate less compliance with recommended ranges or amounts. An HEI score over 80 implies a “good” diet, an HEI score between 51 and 80 implies a diet that “needs improvement,” and an HEI score less than 51 implies a “poor” diet. (USDA, *The Healthy Eating Index: 1999-2000*, p. 7).
The Healthy Eating Index score is the sum of 10 components, each representing different aspects of a healthful diet, and each component has an assigned amount of points which are designated as follows. Components 1-5 measure the compliance of an individual’s diet with the Food Guide Pyramid service. Recommendations in the five major food groups of the Food Guide Pyramid include grains (bread, cereal, rice, and pasta), vegetables, fruits, milk (milk, yogurt, and cheese), and meat (meat, poultry, fish, dry beans, eggs, and nuts). For the recommended servings for 1,600, 2,200, and 2,800 calorie per day diets, “Ten points are assigned to each component resulting in a maximum of 50 points” (USDA, *The Healthy Eating Index: 1999-2000*, p. 7). Component 6 measures total fat consumption as a percentage of total caloric intake (RDA < 30%/daily) and “Ten points are assigned if fat intakes are less than or equal to 30 percent of total calories” (USDA, *The Healthy Eating Index: 1999-2000*, p. 7). Component 7 measures saturated fat consumption as a percentage of total caloric intake (RDA < 10%/daily) and “Ten points are assigned to saturated fat intakes of 10 percent or less of total calories and zero points are given if the saturated fat intake is 15 percent or more of total calories” (USDA, *The Healthy Eating Index: 1999-2000*, p. 7). Component 8 measures total cholesterol intake (RDA < 300 milligrams/daily) and “Ten points are given if cholesterol intake is less than or equal to 300 milligrams and zero points are given when intake reaches 450 milligrams or more” (USDA, *The Healthy Eating Index: 1999-2000*, p. 7). For component 9, which measures total sodium intake (RDA 2,400 milligrams/daily), “Ten points are given at an intake level of 2,400 milligrams or less and zero points are given at a level of 4,800 milligrams or more” (USDA, *The Healthy Eating Index: 1999-2000*, p. 7). Component 10 measures variety in the diet, “by adding together
the number of 'different' foods eaten in amounts sufficient to contribute at least one-half of a serving in a food group.” According to the guidelines, “Ten points are given if at least half a serving of eight or more different types of food items are eaten daily and zero points are given if at least half a serving of three or fewer different foods were eaten in a day” (USDA, *The Healthy Eating Index: 1999-2000*, p. 7).

To date, the application of the HEI is evident in national food consumption surveys such as the National Health and Nutrition Examination Survey (NHANES). NHANES is a massive health-census conducted every 10 years by the Centers for Disease Control (CDC) and Center for Health Statistics in order to survey the dietary habits and health of U.S. residents. NHANES consists of a series of periodic surveys that collect height, weight, and other information on the U.S. population, and data from NHANES was used to construct the 1977 NCHS growth charts and the 2000 CDC Growth Chart.

By developing various strategies, the HEI is able to accommodate wide arrays of diets from various segments of the population. The HEI has proven to be a useful and practical instrument for assessing diet quality. Results from the index can provide insights into how to improve eating patterns. The HEI has an online interactive self-assessment version called the Interactive Healthy Eating Index (IHEI), which was also developed by the USDA Center for Nutrition and Public Policy (USDA, *The Healthy Eating Index: 1999-2000*, http://www.nalusda.gov/fnic).

**Block Brief 2000 Dietary Questionnaire.** The Block Brief 2000 Dietary Questionnaire is a 109 item validated, standardized, and quantitative food frequency questionnaire that can be used to obtain information about foods eaten. The questionnaire
is usually self-administered and disseminated in conjunction with portion size photos, used as aids for estimating usual portion sizes for each food (Block, 1991). The food frequency approach requires respondents report the frequency of their consumption of each food on a list of foods associated with risks of diseases, most notably cancer, obesity, heart disease, and diabetes (Block, 1992). The approach also records the usual eating habits of respondents over a period of a year, including all meals and snacks at home or in a restaurant. The Block Brief 2000 Dietary Questionnaire also includes questions on vitamin and mineral supplementations, in addition to the consumption of foods.

Block’s 100-Item Food Frequency Questionnaire (FFQ) was designed to assess nutrient intake levels, as well as the intake of specific foods from the various food groups (e.g., fruits, vegetables, meats) over extended periods of time. The instrument groups food together in various categories (e.g., bananas, apples, pears, and oranges are included in the “fruits group” category). The Nutrition Examination Survey was used to construct the food list, and establish portion sizes and corresponding nutrient values for foods on the questionnaire. The full-length version of the Block measures the frequency of consumption for 100 foods. The Block provides estimates of overall calorie intake and macronutrient composition of the diet. Randomly scheduled 24-hour food recalls is the preferred method to use the instrument. The Block FFQ also revised its portion size asking specific questions on amounts, including actual portion size photos. The photos are three-dimensional representing four different amounts of foods, which are the possible response categories. There are no subscales. The questionnaire is an eight page scanable booklet, addressing at least 90% of the nutrients on the Block database, in
addition to nutrition-related questions regarding fruits and vegetables or frequency and types of fat used in cooking (Spencer, Elon, Hertzberg, Stein, & Frank, 2005). All questionnaires are sent in to the Block FFQ headquarters for interpretations and scoring at a minimal cost. The information is scored and returned both in hard copy and on a disk along with the original questionnaire. Backup copies of all information are kept in the researchers’ database as and are confidential.

Many studies confirm the validity and estimate the reliability of the Block FFQ. This is evident in a study conducted by Boucher et al. (2006), which assessed the validity and reliability of the most recent adaptation of Block’s full-diet FFQ using a sample of Canadian women (Boucher, Cotterchio, Kreiger, Nadalin, Block, & Block, 2006). All participants (n = 166) completed a self-administered FFQ in two different time periods. The mean and median intakes were computed, along with crude and the deattenuated Pearson correlation coefficients between FFQ1 and the average of the two recalls (validity) and between FFQ1 and FFQ2 (reliability). Boucher and colleagues reported that the mean intakes were similar for most nutrients. FFQ reliability was high, with Pearson correlation coefficients having a median of 0.75, ranging from 0.57 to 0.90 (macronutrients) and from 0.65 to 0.88 (micronutrients from supplements and food) (Boucher et al., 2006). FFQ validity was moderate to high, with deattenuated Pearson correlation coefficients having a median of 0.59, ranging from 0.11 to 0.73 (macronutrients) and from 0.50 to 0.76 (micronutrients from supplements and food) (Boucher et al., 2006). The authors concluded that their “micronutrient correlations were similar to or higher than those of other studies that included supplements and two correlations < .40 were associated with fats” (Boucher et al., 2006, p. 90). This study
indicated that the validity and reliability of this full-diet version of the Block FFQ were moderate to high, supporting its use in future studies among Canadian women.

**Body mass index (BMI).** According to the Department of Health and Human Services, body mass index (BMI) is a measure of body fat based on height and weight that applies to both adult men and women according to the following categories.

BMI categories:

- Underweight = \(< 18.5\)
- Normal weight = \(18.5-24.9\)
- Overweight = \(25-29.9\)
- Obesity = \(\geq 30\)

Therefore, BMI measure is based on height (without shoes) in feet and inches and weight (with clothes) in pounds. The researcher will calculate the BMI using the BMI device provided by the Department of Health and Human Services' National Institute of Health website, which can be found at [http://www.nhlbisupport.com/bmi/](http://www.nhlbisupport.com/bmi/).

According to the World Health Organization (WHO), the ranges of BMI values listed above are valid only as statistical categories when applied to adults, and do not predict health. Generally, the Index is suitable for recognizing trends within sedentary or overweight individuals because there is a smaller margin for errors. This general correlation is particularly useful for consensus data regarding obesity or various other conditions because it can be used to build a semi-accurate representation from which a solution can be stipulated or the RDA for a group can be calculated. BMI calculations have been reported to be highly reliable but discrepancies in the self-reported measures of height and weight have been found throughout the literature. BMIs based on self-reported
height and weight values have tended to underestimate the prevalence of overweight members of the adolescent populations (Brener, Mcmanus, Galuska, Lowry, & Wechsler, 2003). BMI can be calculated quickly and without expensive equipment. However, BMI categories do not take into account many factors, such as frame size and muscularity (Brener et al., 2003). The categories also fail to account for varying proportions of fat, bone, cartilage, water weight, and other factors.

**Nutrition Knowledge Questionnaire.** Nutrition knowledge is measured by the Nutrition Knowledge Questionnaire developed by Parmenter and Wardle (1999). The questionnaire was developed to analyze the relationship between nutrition knowledge and dietary behavior. It includes 44 questions, a variety of which address current dietary recommendations, sources of nutrients, everyday food choices, and the relationships between diet and disease (Parmenter & Wardle, 1999). According to the authors, these four areas underlie the main aspects of knowledge about dietary behavior, which are as follows:

- Do people know what current expert dietary recommendations are?
- Do they know which foods provide the nutrients referred to in the recommendations?
- Can they choose between different foods to identify the healthiest ones?
- Do they know what the health implications of eating or failing to eat particular foods are?

The survey includes a variety of types of questions, including dichotomous fill in the blanks and multiple choice items on four categories, and the maximum scores for each category follow: Dietary Recommendations (11), Sources of Nutrients (69),
Choosing Everyday Foods (10), and Diet-Disease Relationships (20). This results in a potential total score of 110. Parmenter and Wardle (1999) conducted a study to test the reliability and validity of the nutrition knowledge questionnaire. The items were generated paying particular attention to content validity. The authors reported that the initial version of the questionnaire was piloted and assessed using psychometric criteria (Parmenter & Wardle, 1999). Items that did not reach acceptable construct validity levels were excluded, and the final 50-item version was administered to two groups differing in nutritional expertise on two occasions in order to assess criterion-related validity and test-retest reliability. The results indicated the internal consistency of each section was high (Cronbach's alpha 0.70 - 0.97) and the test-retest reliability was above the minimum requirement of 0.70. Nutrition experts scored significantly better than computer experts, indicating good criterion-related validity. The authors concluded “that the instrument meets psychometric criteria for reliability and construct validity and provides a useful scale with which to reassess the relationship between knowledge” (Parmenter & Wardle, 1999, p. 301-302).

Wellness Evaluation of Lifestyle (WEL). The Wellness Evaluation of Lifestyle (WEL), developed in 2004 by Myers, Luecht, and Sweeney (2004), is a self-reported measure used to assess “the characteristics of healthy persons” (Myers, Luecht, & Sweeney, 2004, p. 4). The WEL is the most recent version of an instrument originally published in 1993. It was created for individuals 18 years and older. The WEL resulted in 20 different scores for 17 subscales, two composite scales—“Self-Direction” and “Total Wellness”—and a “Perceived Wellness Scale.” The WEL can be administered in
individual or group formats, and also through a website. It takes approximately 15-20 minutes to complete.

According to Myers et al. (1998), “The purpose of the Wellness Evaluation of Lifestyle (WEL) is to help respondents make healthy lifestyle choices based on their responses to each of the five life tasks and subtasks defined in the Wheel of Wellness” (p. 120). The life tasks of spirituality, self-direction, work and leisure, friendship, and love interact with a variety of life forces and global events. The instrument consists of a total of 131 items, all of them statements regarding the self to which respondents reply using a five-point Likert scale. The Likert scale scores range from 1, which equals strongly agree, to 5, which equals strongly disagree. Scores are simple sums of responses divided by the total points possible; thus, scores represent the percent of total wellness. WEL Life Task Scales include Spirituality, Self-Regulation, Work and Leisure, Friendship, Love, Total Self, Regulation, Perceived Wellness, and Total Wellness. The two scales that have subscales include Self-Regulation, with subscales of sense of worth, sense of control, realistic beliefs, emotional responsiveness, intellectual stimulation, sense of humor, nutrition, exercise, self-care, stress management, gender identity, culture identity, and leisure. The second scale with subscales is Work and Leisure, with the subscale work and leisure. In the WEL, one score is provided for each of the life tasks and sub-tasks, as well as a composite score for “total wellness.” Scores are presented in a profile that allows for interpretations based on individual scores and patterns. The WEL can be used as an adjunct to counseling to help people develop and maintain healthy lifestyles that promote well-being over lifespan, quality of life, and longevity (Myers et al., 1998).
To score the WEL, raw scores for each of the scales are added together and then divided by the total number of items within a subscale. The results, presented as percentage values, purportedly “represent a percent of total wellness,” and “This interpretive problem is only further compounded when one considers that most subscales (12 of 17, or 71%) contain only six or fewer items, thus severely constraining the content validity of the construct domains assessed by each subscale” (American Counseling Association Manual, 2008, p. 16). The manual suggests “the interpretation of test scores can be done at the level of individual subscale scores, total wellness score, or by an examination of patterns of scores” (American Counseling Association Manual, 2008, p. 1). However, the authors provided few guidelines for scale interpretation, and no information concerning the interpretation of patterns of subscale scores.

According to the literature, “The WEL was developed and pilot tested as an iterative process through a series of seven studies conducted over a 10-year period to field test items and improve the psychometric properties of the scale scores” (Myers, 2004, p. 121). Test-retest reliability coefficients for the WEL scale scores, obtained using a sample of 99 undergraduate students (Myers, 2004), ranged from 0.68 for cultural identity to 0.88 for nutrition. Internal consistency measures of reliability (i.e., Cronbach’s [alpha] coefficients) ranged from low 0.60 for the realistic beliefs score to a high 0.94 for friendship within a larger and more diverse sample of 2,295 adults from across the lifespan.

The only validity data presented for the WEL was based on 229 graduate counseling students “who took the WEL and other instruments over a four-year period as part of courses in lifespan development and wellness” (Myers et al., 1998, p. 12).
Convergent and divergent validity were investigated by comparing the scores of 229 counseling graduate students on various WEL scales to scores on similar scales for instruments such as the Coping Resources Inventory (Myers et al., 1998) and TestWell (National Wellness Institute, 1983). These comparisons found that “Scores measuring conceptually similar constructs had high correlations (convergent validity) and scores measuring different constructs had lower correlations (discriminant validity)” (Myers et al., 2004, p. 121). The validity data presented included correlations between a subset of WEL scales and a self-reported measure that also purportedly assesses components of wellness (i.e., the TestWell Scales) (Myers et al., 2004). The authors reported that the WEL Total Wellness composite score correlated at 0.77 with the TestWell composite score. Correlations among subscales identified as conceptually similar tended to be more moderate (median $r = 0.50$).

**Measurement of Nutritional Status and Health: Empirical Studies**

Hiza and Gerrior (2002) conducted a pilot study assessing the quality of college student’s diets using a tool called the Interactive Healthy Eating Index (IHEI). They used an exploratory (comparative) research design, with a convenience sample of 100 college students enrolled in a nutrition class at a state university. Hiza and Gerrior’s literature review was current, dating from 1996 to 2000. It was thorough and informative, providing a detailed background and description of the IHEI. Empirical studies of the diet quality of college students were examined, leading to the conclusion that current research on diet and chronic diseases lacked appropriate methods to evaluate overall diet quality. Thus, Hiza and Gerrior undertook a study of their own.
A convenience sample of 250 students was assembled; however, the final data-producing sample was $n = 100$ (which represents a response rate of 40%). The IHEI was used to measure diet quality in particular, focusing on the types of foods people eat, the variety in their diets, and the degree to which their diets comply with the federal dietary guidelines (i.e., the specific recommendations of the DGA and the Food Guide Pyramid). The instrument was developed by the U.S. Department of Agriculture’s (USDA) Center for Nutrition Policy and Promotion (CNPP). Data collection procedures were clearly described; however, there was no a report verifying that the study was IRB-approved.

Paired sample $t$ tests were used to compare mean scores between subgroups (comparing each student’s intake and recommendations). Students’ independent $t$-tests compared over 100 variables, according to the dichotomous demographic variables for IHEI scores, IHEI component scores, nutrient intakes, and Pyramid servings. The total sample findings indicated that these students did not meet the minimum daily recommendations for servings of fruits, milk, and meat. However, they met and exceeded the recommended requirements for grains, regardless of their age. Findings also confirmed that the HEI was an effective tool in determining the quality of the sampled college students’ dietary intakes and patterns.

Hiza and Gerrior findings report that college students are not meeting the recommended daily minimum serving of grains and vegetables, but did meet the recommended servings for fruit, meat, and milk. Even fewer college students actually meet the recommended maximum servings of the Food Guide Pyramid. Even though findings for mean intakes of nutrients appeared adequate, college students often consumed less than the recommended minimum servings from the Food Guide Pyramid,
often over-reporting foods consumed. The authors also compared their findings to national averages from the CSFII 1994-1996, which were significantly higher than their findings for fruits, total fats, saturated fats, and cholesterol. These findings led Hiza and Gerrior to conclude that the IHEI should be incorporated into introductory college nutrition courses to help educators tailor their course content. The authors concluded that “this type of nutrition education at college level can result in many positive lifestyle changes that can help achieve goals of nutrition and health specified in the Dietary Guidelines for Americans (USDA, 2000) and in the Healthy People, 2010 (DHHS, 2000)” (Hiza & Gerrior 2002. p.10)

The implications for practice concerned the methods used and may serve as a basis for future research on diet quality and risks of related chronic diseases among college students and other subgroups of the American population. The strengths reported by Hiza and Gerrior included the study’s uniqueness, in that the IHEI was used for the first time to measure diet quality. Limitations reported by Hiza and Gerrior included the fact that the single day food records used to assess dietary intake are poor indicators of a person’s usual dietary pattern. These food records were also self-reported, which can be an inaccurate method of measuring, as portion sizes may be over or underestimated. The authors also inferred that foods such as high protein sports drink, supplements, or ethnic dishes may not have been reported due to their exclusion from the IHEI. Hiza and Gerrior reported that future work using the IHEI design should include an updated food database that incorporates many more frequently consumed foods and include physical activity components.
The internal validity strengths of this study were a clearly defined procedure that will allow replication for future studies, and continued updates and improvements to the IHIE will result in a more effective tool for measuring dietary intakes. External validity weaknesses were recognized by the authors, who stated that, because it a convenience sample was used, selection bias may have affected their findings, and the subjects in the study are not necessarily a true representation of other college students in the general university community. Limitations to the study included the fact that food choices in the IHEI are limited and not comprehensive enough to include ethnic dishes. Future studies should focus on the general population of college students, not only nutrition students studying nutrition, because the level of competency may differ and influence the results. In addition, an updated database with more comprehensive possibilities for food selections should be used. The design for this exploratory (comparative) study was very weak, and using a stronger research design and statistical analysis procedures with a larger sample size would strengthen the study. An explanatory (correlation) or prediction study with a much higher level of data analysis (multivariate analysis) would have strengthened the potential for causal inferences.

Nutritional Status of College Students: Empirical Studies

Anding, Suminski, and Boss (2001) conducted a non-experimental study for the purpose of assessing college women’s level of compliance with all the DGA. They used an exploratory comparative research design and focused on students enrolled in three aerobics courses at a university in Houston, Texas. Studies pertaining to the topic cited in the review dated from 1985 through 2000. Empirical studies regarding college students’ diet, exercise and alcohol consumption were examined, revealing a major gap in the
literature regarding the degree to which college women’s dietary habits comply with the DGA (Anding, Suminski, & Boss, 2001).

A non-probability convenience sampling plan resulted in self-selected final data that produced a small sample of n = 60, out of an eligible 103 students, representing a response rate of 58%. The Socioeconomic Profile Questionnaire was used to record participants’ age, ethnicity, weight, height, BMI, marital status, living arrangements, employment status, and reasons for enrolling in the aerobics course. The 3-day Food Record was used to measure dietary intake for three consecutive days. The Self-Reported Physical Activity Scale (SRPA) was used to measure and report exercise habits using an eight-point semantic deferential scale, with a frequency rating scale ranging from 0 (avoiding physical activity completely) to 7 (exercising more than 10 hours per week). Reliability estimates were not reported for any scales. SRPA validity was established for use in college-aged adults. There were no validity reports for the 3-day Food Record and the Socioeconomic Profile Questionnaire. Ethical aspects, including informed consent and confidentiality during data collection, were not described. It was reported that the study was approved by the university’s Committee for Protection of Human Participants (Anding et al., 2001).

The average age of the 60 participants who provided a 3-day Food Record was 21.6 +/- 4.6 years, and participants ranged in age from 17 to 42. Twenty-three percent of the participants categorized themselves as Black (n = 14), 32% as White (n = 19), 20% as Asian (n = 12), 23% as Hispanic (n = 12), and 1% other (n = 1). Eighty-five percent of the participants were not married and 90% commuted to the campus. Overall findings identified no clear pattern of guidelines adherence. It was reported that the MANOVA
was significant at $p < .05$ when comparing dietary intake and overall compliance to DGA goals among ethnic groups. Non-compliances were identified for all the participants regarding a variety of foods and consuming grains, vegetables and fruits; exercising regularly; maintaining a healthy weight; and choosing a diet moderate in sugar and sodium and low in fat. These results supported the hypothesis that college women practice dietary and health behaviors that contradict the 1995 DGA.

Findings of noncompliance with the dietary guidelines suggested participants in the study (college women) “may not have been familiar with the DGA and may not want to or may lack the ability to apply the DGA in their lifestyles” (Anding et al., 2001, p. 171). According to Anding et al., study findings regarding intakes of grains, vegetables, and fruits were lower than those reported by Schuette et al. but similar to those reported by Patterson et al. Huang and colleagues also reported inadequate intakes. Inactivity findings reported in Andings’ study were lower than those in studies by Pinto and Marcus and higher than those in studies by Melby and associates and Brevard and colleagues. These findings led Anding et al. (2001) to conclude that dietary intake, physical activity, and body perception may differ among ethnic groups. This result indicated that the diets and activity habits of all college women could not be characterized on the basis of a preliminary study like the one in question.

Implications for practice were directed to foodservice directors and academicians in the behavioral and health sciences to “offer healthy food choices and opportunities for regular physical activity and to encourage college studies to adopt practices that reflect the DGA” (Anding et al., 2001, p. 173). The strengths reported by authors were that this was the first study to address a group of American college women’s compliance with all
of the dietary guidelines, and findings were comparable to larger studies in respect to DGA guidelines. The limitations reported by authors included the manner in which participants were recruited and small sample size compared with previous studies. The authors reported that preliminary study findings regarding diet and activity habits of all college women could not be generalized (Anding et al., 2001).

The internal validity strengths were that findings demonstrated that compliance with the DGA could result in improved nutritional status in college students. The research design was stronger than a descriptive study, and statistical analyses were at a high level. Threats to internal validity included a research design weaker than that of an experimental study; the lack of reliability and validity for all measures; inadequate, inaccurate and possibly incomplete dietary records (which omitted alcohol and nutritional supplements); and the lack of a theoretical model to guide the study. The sample size, \( n = 60 \), was small for conducting MANOVA. The external validity, or the degree to which one could generalize the results to other populations in other settings, had one strength: the conducting of the study in a natural setting (university). Threats to external validity included the sampling plan (self-selected and convenience) and small sample size, and, therefore, results could not be generalized to another population (population validity) or to settings beyond the university (ecological validity). Future studies could use a non-concealed, unstructured observation method for the variables of college students’ diets, exercise, and alcohol consumption. Anding et al. (2001) did not interpret their results in terms of theoretical models, comparing them instead to existing literature that supported the findings. Findings reported by Anding et al. supported studies regarding intake of
grains, fruits, and vegetables by Patterson et al. and Huang et al. The authors made no reference to findings that did not support other studies.

Future studies should focus on the general population of college students, not only students enrolled in three aerobics courses at a university in Houston, Texas, in order to acquire results that can be applied to the general population. As the design of this exploratory (comparative) study was weak, using a different research design and more advanced statistical analysis procedures with a larger sample size would strengthen the internal validity of study. An explanatory (correlation) or prediction study with a much higher level of data analysis (multivariate analysis) would have also strengthened the potential for causal inferences. Future researchers could also use an updated database that includes more comprehensive food selections in addition to alcohol, as this was a significant part of college students' diets.

Findings similar to those of Anding et al. (2001) were documented in a study Huang et al. (2003) conducted to assess overweight, obesity, dietary habits, and physical activity among college students at the University of Kansas. They used a cross-sectional exploratory (comparative) research design, with a convenience sample of \( n = 736 \), consisting of college students aged 18 to 28 years. Huang et al. (2003) provided only a brief literature review, but it was current and informative in that it presented scarcities and gaps in clinical and epidemiologic literature that specifically referenced college students. Their findings resulted in the testing of the propositions regarding overweight, obesity, diet, and physical activity in proportion in gender, ethnicity, and age groups. The purpose of the study was to define and document these factors as bases for larger
epidemiologic studies about prevention of and interventions for overweight, obesity, poor diets, and inactivity.

The eligibility criterion was that all the students took part in a previous smoking behavior study at the University. Exclusion criteria were not discussed. All participants completed a survey, which included the Berkeley Questionnaire that assessed diet and the Youth Behavior Survey that assessed physical activity. Self-reported height and weight were used to calculate BMI. Chi-square tests were used to examine the difference in proportion between gender and age groups and t-tests examined the difference in mean, with $p = .05$. Ethical aspects, including informed consent and confidentiality during data collection, were noted. The study was IRB-approved.

The author's descriptive findings confirmed that a high percentage of the surveyed students were overweight and engaged in less than healthy dietary habits, suggesting a need for greater attention to diet and exercise. These findings were similar and consistently supported when compared to national samples. Body mass index, physical activity, and intakes of fruit, vegetables, and fiber were lower when compared to national samples, as were the results obtained using t-tests and chi-square tests. The authors drew the following conclusions: a large majority of college students are overweight and obese and are failing to meet minimum dietary and physical activity guidelines.

Regarding implications for practice, the study identified a need to assess the nature of diets, physical activity, and clinical risks for obesity and metabolic syndrome (i.e., a cluster of metabolic dysfunction that predisposes risk to cardiovascular disease and type 2 diabetes) in college students (Huang et al., 2003). The Limitations reported
included the fact that the study relied on self-reported measures of height and weight; thus, findings should be interpreted cautiously due to subjective data. Recommendations for future study were that the specificity and sensitivity of each method should be determined in relation to disease risk. Not only are well-controlled clinical intervention studies for this population necessary, but additional clinical and epidemiological studies of obesity that use both quantitative and qualitative measures should be conducted as well.

The internal validity strengths included comparison of the variables to other findings from large epidemiologic studies in regard to prevention and intervention, and a large sample size for data analysis. Significant threats to internal validity included weak research design, a low level of data analysis, missing information on reliability and validity for some measures, inadequate dietary records (alcohol and nutritional supplements were omitted), possible inaccuracy of self-reported rather than objective data, and limitations in interpretations of findings. One external validity strength was that the study was conducted in a natural setting (university); however, the results cannot be generalized to college students or other populations because of the non-probability of the sampling plan (convenience). A college may be the ideal environment for implementing cost-effective health education and prevention/intervention programs, since students create lifestyle patterns during their college experience.

**Nutrition and Health Education**

Health Promotion and Nutrition Education Intervention lectures and programs are structured around health beliefs and theoretical models. Nutrition education programs and health promotion programs in the United States have incorporated various methods, such
as role playing, video clips, testimonials, presentations from physicians and other educators, social support strategies, food selection and planning activities, and behavior-change-driven pedagogical activities that encourage participants to evaluate personal behaviors and commit to making lifestyle changes (Aldana et al., 2006).

**Scope of Health Promotion and Nutrition Education**

Students rely on several sources of nutrition education when making food choices. The largest influence on students’ eating behavior has been found to be promotional efforts, such as television and radio commercials, which often encourage poor eating habits among young people (Field et al., 1999; Utter, Neumark-Sztainer, Wall, & Story, 2003).

Several studies have examined the effectiveness of nutrition education on subjects’ levels of nutrition knowledge (Gillespie & Shafer, 1990; Lazarus, Weinsier & Booker, 1993; Lin, Guthrie & Blaylock, 1996; Morton & Guthrie, 1998; Skinner, 1991; Thomsen, Terry & Amos, 1998). Fredrick and Hawkins (1992) found that individuals with a basic knowledge of nutrition principles often applied these principles when selecting foods (Frederick & Hawkins, 1992). Similarly, Mitchell (1990) found that 45% of college students reported making healthy dietary changes, though these actual changes were not measured (Mitchell, 1990). Students have reported making wiser food choices and not sacrificing the nutrient quality of their food due to their increasing understanding of caloric density (Dausch, Story, Dresser, Gilbert, Portnoy, & Kahle, 1998). Skinner (1991) also found a decrease in student’s kilocalorie consumption and higher nutrient density following nutrition instruction (Skinner, 1991). Another study was conducted to determine whether the elements of basic nutrition could be taught to individuals who
had no previous nutrition knowledge (Fine et al., 1994). The authors concluded that it is possible to educate young women in basic nutrition, and that college women’s learning capabilities are not influenced substantially by motivation or ability. This conclusion, drawn by Fine et al. (1994), is supported by research on factors that influence learner readiness. Effective education requires assessment of the dietary concerns, practices, and knowledge of a population. Therefore, conducting a baseline nutrition knowledge test prior to nutrition education enables educators to be more effective. In addition, a post-test following instruction assesses the effectiveness of that program.

Exposure to nutrition education, regardless of the individual’s age, may serve as a catalyst for the development of lifelong behaviors to improve nutritional health and BMI. Despite this recognized need for nutrition education directed toward young people, studies have indicated that a large portion of secondary school students have received limited exposure to nutrition education (Fine et al., 1994; Utter et al. 2003).

**Nutrition Education Programs, Models, and Guidelines**

Various nutrition education programs, models, and guidelines have been designed on to achieve different desired goal. There are nutrition education programs, models, and guidelines for national, community, group, and individual recommendations and instruction. Models, programs, and guidelines are designed and used according to the intervention level and procedures required. On the national level, the prominent nutrition models and guidelines are the Food Guide Pyramid, *Healthy People 2010*, and DGA, which are further explored in the review of literature.

An effective nutrition education program or model should focus on all components involved in behavior change, such as nutrition knowledge, attitude, and
perceptions of diet and health. It is also important to include dietary instruction and reinforcing factors that are age appropriate and addresses topics on media influence as well as social and family support. For more detailed and tailored programs, focus can be placed on different cultures, environments, customs, and socio-economic factors, which are all key factors that affect dietary behavior.

Nutrition education programs have, until now, generally been aimed at adults, in situations where individuals have already contracted an advanced disease condition, such as obesity or diabetes, and their dietary behavior has already formed. Nutrition education programs should focus on the adoption of healthy dietary behavior, which should be encouraged from an early age. This is not only the case because unhealthy dietary behavior at an early age causes greater potential risks for adulthood diseases, such as cardiovascular diseases, but also because such behavior can persist indefinitely (Boreham et al., 1993).

Information inference, health food selection, fast food advertising and restaurant choices, preparation and cooking, storage, and food labels are all pertinent topics that should be addressed when targeting and designing programs for college students. Dissemination of information could occur via television, radio, newspapers, newsletters, brochures, videotapes, and computer software.

**Food Guide Pyramid.** The Food Guide Pyramid, designed and created by the USDA’s Center for Nutrition Policy and Promotion, was been revised in 2007 and is now called Mypyramid. Mypyramid outlines what to eat each day based on the dietary guidelines. The pyramid can be used as a guide for all healthy Americans endeavoring to eat a variety of foods to acquire the nutrients they need to maintain healthy weights.
"The food guide pyramid suggested optimal nutrition guidelines for each food category, per day, using a mnemonic graphic of a pyramid with horizontal dividing lines, to represent suggested percentages of the daily diet for each food group" (Food Guide Pyramid, 2000, p. 25).

Food Groups included in the Food Guide Pyramid are as follows:

The *Grain Group* includes various bread, cereal, rice, and pastas. Whole grains products contain dietary fiber, essential fatty acids, and other important nutrients. The recommended grain product servings are 6 to 11 per day. The *Vegetable Group* includes vegetables that contain many vitamins and minerals; however, different types of vegetables contain different nutrients, which make it important to eat a variety of vegetables. Green vegetables typically contain vitamin A, dark orange and dark green vegetables contain vitamin C, and vegetables like broccoli and related plants contain iron and calcium. Vegetables are very low in fats and calories. The recommended vegetable servings are 7 to 9 per day. These may be fresh, frozen, canned, or juiced. The *Fruit Group* includes apples, oranges, plums, and bananas, among others. Fruits are low in calories and fat and a source of natural sugars, fiber, and vitamins. It is best to consume 2 to 4 servings of fruit in a day. These may be fresh, frozen, canned, dried, pureed or juiced. The *Oil Group* includes oils, sugars, sweets, ice cream, candy, and chocolate, among other such items. It is recommended that all food that contains oils, fats, and sugars be eaten sparingly and in small amounts. The *Dairy Group* includes milk, yogurt, and cheese products. Milk and its derivatives are a rich source of the mineral calcium, but also provide protein, phosphorus, vitamin A, and vitamin D. However, many dairy products are high in saturated fat and cholesterol compared to vegetables, fruits and
whole grains, which is why skimmed products are available as alternatives. For adults, three cups of dairy products per day are recommended. The *Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts Group* includes both animal and plant proteins. Meat is the tissue, usually muscle, of an animal consumed by humans. Since most parts of many animals are edible, a vast variety of meats exist. Meat is a major source of protein, as well as iron, zinc, and vitamin B12. Meats, poultry, and fish include beef, chicken, pork, salmon, tuna, shrimp; eggs, spices, and herbs are also in this group.

According to a study conducted by Park et al. (2005), "Dietary patterns have been used to identify typical combinations of foods that may be associated with disease risks" (p. 843). Park et al. (2005) analyzed dietary patterns using the Food Guide Pyramid Groups and lifestyle factors of 195,298 participants from five ethnic groups (African Americans, Hawaiians, Japanese Americans, Latinos, and Whites) between 1993 and 1996. The study's findings supported the initial hypothesis that dietary patterns are influenced by interrelated sociocultural, demographic, and other lifestyle factors and may be useful for investigations of diet-disease relationships.

**Dietary Guidelines for Americans (DGA).** The DGA, first published in 1980, provided science-based advice to promote health and reduce risk of chronic diseases through diet and physical activity. The guidelines were designed for persons two years of age and older (USDA, 1995). They include the following:

- Balance the food you eat with physical activity—maintain or improve your weight.
- Choose a diet with plenty of grain products, vegetables, and fruits.
- Choose a diet low in fat, saturated fat, and cholesterol,
Choose a diet moderate in sugars.

Choose a diet moderate in salt and sodium.

If you drink alcoholic beverages, do so in moderation. (USDA, 1995)

In order to meet the Dietary Guidelines, individuals must consume most of their calories through grain products, vegetables, fruits, low-fat milk products, lean meats, fish, poultry, and dry beans and consume fewer calories from fats and sweets. The dietary guidelines are designed to help Americans choose diets that will meet nutrient requirements, promote health, support active lives, and reduce chronic disease risks (USDA, 1995). Research findings suggest that certain diets raise risks for chronic diseases. Such diets are high in fat, saturated fat, cholesterol, and salt, and they contain more calories than the body uses. They are also low in grain products, vegetables, fruits, and fiber. The DGA serve as the basis for federal food and nutrition education programs.

Food choices also help reduce the risk of chronic diseases, such as heart disease, certain cancers, diabetes, strokes, and osteoporosis, which are leading causes of death and disability among Americans. Healthy diets may reduce major risk factors for chronic disease factors, such as obesity, high blood pressure, and high cholesterol. Figure 2.5 displays the Dietary Guidelines for Americans used to promote health and reduce risk of chronic diseases through diet and physical activity.
Figure 2.5. “Dietary Guidelines for Americans” by the Department of Health and Human Services’ website: http://www.health.gov/dietaryguidelines/

Healthy People 2010. Healthy People 2010 was developed through a broad consultation process, built on the best scientific knowledge, and designed to measure programs over time. Healthy People 2010 provides a framework for prevention informed by national health objectives and designed to identify the most significant preventable threats to health and establish national mechanisms for reducing these threats. Different individuals, states, communities, professional organizations, and others have incorporated
Healthy People 2010 on different levels in the development of programs to improve health. Healthy People 2010 was designed to achieve two overarching goals. Goal 1—“Increase Quality and Years of Healthy Life”—was intended to help individuals of all ages increase life expectancy and improve quality of life. Goal 2—“Eliminate Health Disparities”—was intended to eliminate health disparities among different segments of the population (Healthy People 2010, 2007). Healthy People 2010 has recorded 467 specific objectives, and one health objective identified as most relevant to this paper is Objective 1-3: “to increase the proportion of persons appropriately counseled about health behaviors.” The objective also delineates the steps of this process, which include an increase in counseling on health behaviors among persons at risk with a physician visit in the past year and to increase physical activity or exercise (for adults aged 18 years and older) and improve diet and nutrition (again, for adults aged 18 years and older). Objective 7-3 was identified as relevant as well—“Increase the proportion of college and university students who receive information from their institution on each of the six priority health-risk behavior areas”—as was 19-3, which suggested Americans should “Reduce the proportion of children and adolescents who are overweight or obese.”

Healthy People 2010 presented leading health indicators, which will be used to measure the health of the nation for the next 10 years. Each of the 10 indicators has been associated with one or more of the objectives from Healthy People 2010. As a group, the Leading Health Indicators reflect the major health concerns in the United States at the beginning of the 21st century. They were selected on the basis of their ability to motivate action, the availability of data to measure their progress, and their importance as public health issues. They include physical activity, overweight and obesity, tobacco use,
substance abuse, responsible sexual behavior, mental health, injury and violence, environmental quality, immunization, and Access to Health Care (Healthy People 2010).

**Nutrition and Health Education: Empirical Studies**

Matvienko, Lewis, and Schafer (2001) conducted an experimental study using a college nutrition science course as an intervention to prevent weight gain in female college students. The authors’ literature review was informative, presenting the current prevalence of obesity, high BMI, and nutrition knowledge deficits among college students. Empirical studies focusing on high school and college students’ lack of and failure to apply of nutrition knowledge were examined, leading to the identification of a gap in the literature regarding the need for effective nutrition and health education prevention and promotion programs. This resulted in a study testing the hypothesis that a nutrition course that stresses principles of human physiology, energy metabolism, and genetics helps to prevent weight gain during the first year of college.

A convenience sample of 42 students was invited to participate in the study. The intervention group and the control group were recruited by advertising in student newspapers and posting flyers throughout the college campus. The research design consisted of a randomized control trial that resulted in a final, data-producing sample of n = 40, with n = 21 in the intervention group and enrolled in the college nutrition course and n = 19 in the control group (and not in the nutrition course). The Block Questionnaire is a 116-item, semi-quantitative food frequency survey used to measure dietary intake. It had been previously validated through biochemical indicators and food records. Height and weight were measured using a Health 0 Meter scale. Data collection procedures were clearly described; no report indicated that the study had been IRB-approved.
The reliability coefficient for the measure of knowledge, using retest reliability estimates, was $r = .881$ for the overall knowledge score, $r = .907$ for the nutrition knowledge score, $r = .761$ for the knowledge of energy metabolism, and $r = .744$, for psychological knowledge supporting the proposed hypothesis. Findings indicated that knowledge improved and that BMI had been maintained for one year after the intervention course all students who had been enrolled. The subjects that received the intervention through the nutrition course reported consuming fewer kcal/day than the baseline amount, whereas the control subjects reported consuming more kcal/day. The total knowledge score for the intervention subjects improved significantly compared to the control group. Numerous empirical studies on the effects of nutrition education and weight loss on obese subject have been presented; however, educational interventions to prevent weight gain in non-obese individual remain scarce.

The implications for practice suggested that nutrition educators could use these results to promote a science-based, problem solving education intervention aimed at reducing high BMI among late adolescents or young adults (Matvienko et al. 2001). The limitations reported by Matvienko et al. (2001) included the small sample size and self-selected subjects. The study’s internal validity weaknesses included that fact that the study design consisted of a nutrition intervention course and a control group for comparison. Each group was also given the same knowledge test at baseline, 4 months after the study began, and again 16 months after. The external validity weaknesses included the self-selected sampling plan and the fact that only women were studied because an insufficient number of male students responded to the recruitment flyer and newspaper advertisement. Another limitation of the study was that all dietary records
were self-reported. Future studies should include both female and male college students and a larger sample size to better reflect the general college population.

Internal validity strengths included the research design, which incorporated the intervention and control group. Significant threats to internal validity were that the study was weak in statistical analysis, missing reliability, and validity on all measures. The external validity of the sample was hindered by the fact that it was both small and a convenience sample, and, therefore, it cannot be generalized to other population.

The long-term goal of nutrition education is to enable consumers to make informed decisions and thus improve their BMI and overall health (Sandoval & Muellar, 1989). By tailoring nutrition information to a segment of the population with specific food habits and eating practices, educational programs can have more meaningful content and more successful outcomes (Fine et al., 1994). The learning process is slow, commencing with an individual’s awareness and desire to change. It involves the development of knowledge and skills in order to produce a change in behavior (Byrd-Bredbenner, Shannon, Hsu, & Smith, 1988). Through the instructor’s persuasion, students develop skills and learn how to implement their new knowledge in order to change their eating behaviors. Positive behavior changes have been noted during students’ enrollment in nutrition courses (Mitchell, 1990).

Synopsis of the Literature

This research explored nutrition knowledge, lifestyle dietary self-efficacy, and BMI of college students. The literature indicated that college students’ non-compliance with the DGA has been cited as one of the primary causes of eating disorders, physical
inactivity, and the risk of developing chronic diseases (Anding et al., 2001; Dzokoto et al., 2007; Jackson et al., 2007; Luquis et al., 2003). Weight gain, lack of regular exercise, and unhealthy eating patterns commonly appeared to develop during the first two years of college (Jackson et al., 2007).

Researchers and health educators have proposed different strategies for assessing, monitoring, and promoting dietary patterns among college students, as such patterns are essential to maintaining a healthy lifestyle.

Theoretical literature explaining major health behavior theories include Ajzen and Fishbein’s (1991) TRA, Ajzen’s (1991) TPB, Bandura’s (1986) SCT, and Hochbaum, Rosenstock, and Kegels’s (1950) HBM. These theories provide sound propositions that explain health behaviors and intervention programs and their applicability to diverse populations. The current models and theories examined in this research have dominated not only psychology and health education fields but also business and marketing fields.

Between 70% and 90% of all deaths in the United States result from chronic diseases, such as cancer, cardiovascular disease, strokes, and diabetes, which are exacerbated by poor nutrition, sedentary living, alcohol consumption and tobacco use (Aldana et al., 2006). Poor nutrition habits, sedentary living, alcohol consumption and tobacco use are all chosen lifestyle behaviors governed by the health beliefs of individuals. According to Aldana et al. “The largest reductions in chronic disease prevalence in the United States will be achieved when individuals adopt and maintain lifestyles that include a healthy diet and regular physical activity” (2006, p. A01). Therefore, this study examined the differences in BMI among college students in the US according to their personal characteristics, nutrition knowledge, and dietary self-efficacy.
College students are at a vulnerable time in their lives as they have less parental control and more freedom to make their own decisions and lifestyle choices. They are also regarded as nutritionally vulnerable because their diets are often low in energy, fiber, calcium, iron, vitamin A, and carotenoids, but high in fat (Franciscy et al., 2004). As Franciscy et al. (2004) asserted, students reported “Higher intakes of energy, total fat, regular soft drinks, cholesterol, sodium and alcohol and also reported lower intakes of vegetables by male than female college students” (p. 29). Some of these lifestyle choices or behaviors may have the potential to affect their immediate and future health (Dawson et al., 2007).

The review of the literature suggested that college students are not following the selected components of the DGA. Instead, research has indicated that college students exceed current recommendations for total fat and saturated fat intake. They lead sedentary lives and an estimated 10% of all U.S. college students drink more than 15 alcoholic beverages per week (Anding et al., 2001). College students’ non-compliance with the DGA has been cited as one of the primary causes of eating disorders, physical inactivity, and risk of developing chronic diseases (Anding et al., 2001). In their study, Anding et al. (2001) concluded that weight gain, lack of regular exercise, and unhealthy eating patterns appeared to be common among students in the first two years of college. The study by Huang, Harris, Lee, and Nazir (2003) also suggested that college engage in low levels of physical activity and high levels of unhealthy dietary habits. The following theoretical and empirical conclusions resulted from this review, and this synopsis ends with recommendations for future inquiry.
Theoretical Conclusions

Major theories used to explain health beliefs, lifestyles behaviors, nutrition, and health choices include the TRA, TPB, SCT, and the HBM (Azjen, 1999; Glanz et al., 1997, Luszczynska et al., 2005). These theories have significant empirical validity, social utility and significance (Ajzen, 1991; Ajzen & Driver, 1991; Jemmott & Fong, 1992; Montano & Taplin, 1991).

All the theories presented in this review are prominently used in many areas of psychology for describing, exploring, explaining, predicting, and changing human behavior (Azjen, 1991; Glanz et al., 1997; Luszczynska et al., 2005). These theories have also been relevant to health communication and education fields, as they have aided the facilitation of new behavioral research. In addition, they provided frameworks for designing, implementing, and evaluating intervention programs (Glanz et al., 1997).

These theories have been used to more effectively develop messages aimed to persuade individuals to make healthy decisions. Therefore, in several studies they have been useful in health education and intervention programs that address problems such as diabetes, drug use, physical inactivity, healthy eating habits, smoking sensation, hypertension, eating disorders, contraceptive use, or breast self-examination (Azjen, 1991; Ajzen & Driver, 1991; Glanz et al., 1997; Jemmott & Fong, 1992; Luszczynska et al., 2005; Montano & Taplin, 1991).

Ajzen’s (1991) TPB is a predominant current model often used to assess behavior, intentions, and issues related to health that has significant empirical validity, utility, and significance. The theory’s effectiveness for determining both behavior and intention is
well-developed. It is an extension of the TRA, which explains behavior more broadly and accounts for factors outside the control of an individual (Azjen, 1991; Glanz et al., 1997).

The TRA is also a well-developed theory for describing, exploring, explaining, and predicting behavior. Mullen, Hersey, and Inversion (1987) have criticized the theory, stating that it does not adequately account for emotional fear-arousal elements, such as perceived susceptibility to illnesses. Ajzen's (1991) TRA also faces limitation due to its assumption that behavior is under volitional control. Irrational decisions, habitual actions, or any behavior not consciously considered by an actor cannot be explained by this theory (Azjen, 1991; Glanz et al., 1997). Another limitation of the TRA is that it must be used in conjunction with other theories and models, such as the Self-Regulation Theory (Leventhal & Cameron, 1987) or Protection Motivation Theory (Rogers & Mewborn, 1976), in order to more accurately explain behavior.

The HBM has two weaknesses; the first is caused by the fact that health beliefs compete with other beliefs and the second by the attitudes of individuals, which can also influence behavior. The HBM has also been used in social psychology research, revealing that belief formation always precedes behavioral change.

The SCT is another well-developed theory used for describing, exploring, explaining, and predicting behavior; however; health educators and behavioral scientists have argued that it is too complex in its formulation and suggested the use of more parsimonious theories. Domel (1994) criticized the theory as well, suggesting that more attention be paid to nonlinear aspects of the SCT; for example, self-efficacy should be used to predict behavior primarily when positive outcome expectations are high. The empirical validity of SCT remains in question because several large-scale, funded
intervention studies that have been conducted using SCT constructs have not resulted in changed behaviors (Carleton, 1995; Fortmann, 1993; Luepker, 1994).

Empirical Conclusions

The critical problem—that college students continue to engage in unhealthy lifestyle behaviors such as poor eating, drinking alcohol, not exercising, and smoking, despite the serious consequences—has been confirmed repeatedly by the literature (Anding et al., 2001; Dzokoto et al., 2007; Jackson et al., 2007; Luquis et al., 2003; McAthur et al., 2002).

In particular, studies by Jackson et al. (2007), Anding et al. (2001), and Huang et al. (2003) have indicated that personal characteristics, such as gender, race, and age, have significant main effects on the level of people's engagement in health promoting behaviors and lifestyles.

Study findings also confirmed that self variables, health self-efficacy, and health values have been significant predictors of engagement in health promoting lifestyles among college students (Jackson et al., 2007; Luquis et al., 2003; McAthur et al., 2002). Notably, health behaviors have been shown to be a function of value attached to good health outcomes and personal beliefs (e.g., self-efficacy) (Jackson et al., 2001; Jett et al., 1998; Zweig et al., 2001).

Empirical studies found that dietary patterns have been influenced by socio-cultural and other demographics as well as lifestyle factors. Furthermore, the relationships between certain foods or combinations of foods may be associated with particular disease risks (Boreham et al., 1993; Park et al., 2005; USDA, 1995).
Research also confirmed that the college diets of students' reflect patterns low in energy, fiber, calcium, iron, vitamin A, and carotenoids, but high in fat (Anding et al., 2001; Binger, 1999; Huang et al., 2003; Hertzler et al., 1995).

Research in the area of health and well-being tends to focus on weight loss in obese people or educational intervention programs that prevent weight gain (Byrd-Bredbenner et al., 1998; Fine et al., 1994; Lewis & Schafer, 2001; Matvienko et al., 2001; Sandoval & Miller, 1989).

Numerous studies have documented that nutrition education enables people to make informed decisions and therefore improves their nutritional status and health (Anding et al., 2001; Byrd-Bredbenner et al., 1998; Fine et al., 1994; Huang et al., 2003; Jackson et al., 2007; Matvienko et al., 2001; Lewis & Schafer, 2001). Research has also indicated that an individual's college period is a highly influential time and that students tend to make unhealthy choices. Nutrition education at the college level can result in many positive lifestyle changes that can help students achieve the goals for nutrition and health specified by the DGA (USDA, 2000) and Healthy People 2010 (HHS, 2000; Hiza & Gerrior, 2002).

The studies reviewed often had limited sample sizes, which posed a threat to both internal and external validity. An insufficient sample size limits a researcher's ability to conduct statistical analyses, such as exploratory factor analysis and regression (Jackson et al., 2007; Luquis et al., 2003). Studies also showed weakness due to an over-reliance of convenience sampling, which threatened the generalizeability of findings (external validity) (Anding et al., 2001; Dzokoto et al., 2007; Jackson et al., 2007; Luquis et al.,
2003). External validity was also threatened by the limited diversity of the population and samples (Jackson et al., 2007; Luquis et al., 2003).

Empirical studies exploring the diet, exercise, and alcohol consumption of college student were examined, leading to the identification of a major gap in the literature regarding the degree to which college women comply with the Dietary Guidelines for Americans (Anding et al., 2001). Huang et al. (2000) also identified a scarcity of clinical and epidemiologic literature that makes specific reference to the dietary habits of college students, another major gap in the research.

Empirical studies that probe the lack of knowledge about and poor application of nutrition knowledge among high school and college students were examined. The major conclusions included the fact that total knowledge scores for the intervention subject improved significantly compared to the control group; however, educational interventions to prevent weight gain in non-obese individuals were scarce. This has led to a gap in the literature regarding the need for effective nutrition and health education prevention and promotion programs in college settings (Luquis et al., 2003; Sandoval & Mueller, 1989). Additional studies are needed in order to better explain the underlying reasons college students engage in unhealthy dietary habits despite serious consequences.

National health objectives, guidelines, and recommendations were reviewed as well. Healthy People 2010, DGA, Food Guide Pyramid, and RDA (USDA, 1995) are well-developed with significant empirical validity, utility, and significance. They provide the foundation for effective nutrition education programs or models, the components of which focus on promoting behavior changes through increased nutrition knowledge, attitudes, and perceptions of diet and health.
Measurements used to analyze behavior include the Youth Behavior Survey (Huang et al., 2003), the Self-Rated Scale (Jackson et al., 2007), the Marlowe-Crowne Social Desirability Scale (Jackson et al., 2007), Health Promoting Lifestyle Profile II (Jackson et al., 2007), the Self-Rated Abilities for Health Practice Scale (Jackson et al., 2007), and the WEL (Hattie et al., 2008; Myers et al., 2004). The validity and reliability of all these instruments have been documented.

There are limited reported studies on nutrition knowledge and dietary self-efficacy in particular reference to college students. However, there are no documented studies that have combined looking at nutrition knowledge, and dietary self-efficacy using BMI as the measure. Therefore, this study proposed the following research questions and research hypotheses:

**Research Questions**

1. What are differences in BMIs of normal and overweight college students according to their personal characteristics?
2. Are there differences between BMIs of normal and overweight college students according to their nutrition knowledge?
3. Are there differences between BMIs of normal and overweight college students according to their dietary self-efficacy?

**Research Hypotheses**

1. There are significant differences in BMIs of normal and overweight college students according to their personal characteristics.
2. There are significant differences in BMIs of normal and overweight college students according to their nutrition knowledge.

3. There are significant differences in BMIs of normal and overweight college students according to their dietary self-efficacy.

Chapter 2 provided an in-depth literature review and theoretical framework leading to the proposition of research questions and research hypotheses addressed in this study. Chapter 3 presents the methodology used to test the research hypotheses to answer research questions of this study.
Chapter 3: Research Methods

Chapter 3, presents the research methods to be used answering the research questions and testing the hypotheses contained within the theoretical framework of this study. The study examined the differences in personal characteristics, nutrition knowledge, and dietary self-efficacy of normal and overweight (measured by body mass index) college students in the United States. This chapter examined the research design, population, sampling plan and setting, instrumentation and the data analysis that has been conducted for the study. The last section of this chapter includes an evaluation of the research methods that was utilized in this study.

Research Design

A non-experimental quantitative exploratory (comparative) research was used to compare the differences in personal characteristics, nutrition knowledge, dietary self-efficacy, and BMI of college students in the United States. College students, including male and female participants ages 18 and older were recruited online from various colleges throughout the United States, which constituted the sample.

In this study, a four-part, self-reported survey (see Appendix A) has been utilized. Part 1, developed by the researcher, provided the demographic characteristics, which reported demographics for participating college students in the U.S., such as age, gender, marital status, race, ethnicity, employment status, and level of college. Part 2 measured nutrition knowledge using the Nutrition Knowledge Questionnaire designed by Parmenter and Wardle (1999). This questionnaire was developed to analyze nutrition knowledge and consisted of four main areas related to dietary knowledge: current
experts’ dietary recommendations; foods providing the nutrients referred to in those recommendations; choices between different foods that identify the healthiest ones; and the health implications of eating or failing to eat particular foods. Part 3: Dietary Self-Efficacy was measured by the Dietary Confidence Survey (Sallis et al., 1988). The Dietary Confidence Survey is a 20-item survey developed to measure the degree to which subjects are sure they can make dietary behavior changes. The scale measures self-efficacy for health-related behaviors, primarily including diet exercise behaviors. In Part 4, which described weight status, BMI, based on height (without shoes) in feet and inches and weight (with clothes) in pounds, was used as a measure. The researcher calculated the BMI using the BMI device provided by the Department of Health and Human Services’ National Institute of Health website at [http://www.nhlbisupport.com/bmi/](http://www.nhlbisupport.com/bmi/).

The sample size included 126 male and female college students. There were 62 participants within the overweight BMI category and a total of 64 participants within a normal BMI category. The sampling plan was a convenience sample and participants were recruited via the Internet through Facebook. The Facebook page provided a brief introduction and explanation of the study and a link to connect participants directly to the online questionnaire provided by the server, Survey Monkey. The researcher calculated the students’ BMIs using the participants’ self-reported height and weight. This study focused on normal and overweight groups, with 18.5 to 24.9 BMI reflecting normal and 25 to 29.9 BMI reflecting overweight. The researcher calculated the BMIs and the surveying were continued until the researcher collected more than 50 samples for each category. A total of 201 surveys were collected however, incomplete surveys and participants within an underweight BMI category and within an Obese BMI category
were not included. Participation was voluntary and participants identity protected by anonymous survey.

The Statistical Package for Social Sciences (SPSS) version 18.0 was utilized in the data analysis. For this research study descriptive statistics of the sample was used to describe the sample’s characteristics, which include age, gender, marital status, race, ethnicity, employment status, and level of college. Mean scores, frequency distribution, percentage of responses for each variable, and variability (such as range and standard deviation) were conducted. Chi-square tests were used to test the impact personal characteristics between on normal and overweight college students. For categorical data Chi-square with the significant level of \( p < .05 \) will be used to test Research Hypothesis 1, that there are significant differences in BMIs of normal and overweight college students according to their personal characteristics. Research Hypothesis 1 was used to answer Research Question 1, which states, what are the differences in BMIs of normal and overweight college students in the United States according to their personal characteristics. Independent \( t \)-tests with the significant level of \( p < .05 \) was used to test Research Hypothesis 2, which states there are significant differences in BMIs of normal and overweight college students according to their nutrition knowledge. Research Hypothesis 2 was used to answer Research Question 2, are there significant differences between BMIs of normal and overweight college students according to their nutrition knowledge. Independent \( t \)-tests with the significant level of \( p < .05 \) was used to test Research Hypothesis 3, which states that there are significant differences in BMIs of normal and overweight college students according to their dietary self-efficacy. Research Hypothesis 3 was used to answer Research Question 3, are there significant differences
between BMIs of normal and overweight college students according to their dietary self-efficacy.

**Population, Sample, and Setting**

A convenient sample of male and female college students, aged 18 years and older, were invited to participate in the study. Recruitment was continued until a minimum sample of 100 (more than 50 for each category) was achieved. The study sample was recruited via the Internet through Facebook for college students throughout the United States.

**Population.** All college students in the United States of America.

**Accessible population.** All college students with access to the Internet and Facebook. The target population was a convenient sample of male and female college students aged 18 years and older. The study sample was recruited via the Internet through Facebook page for college students throughout the United States.

**Sample population.** College students, male and female and 18 years of age and older in the United States, who self-select by logging on and have access to Facebook.

**Sampling plan.** A convenient sample of college students 18 years of age and older were invited to participate in the study via the Web. Recruitment was continuous until a minimum sample of 100 (more than 50 for both the normal and overweight BMI categories) had been achieved. The final data-producing category of college students were determined by the researcher calculation of the participants BMIs. A BMI category of 18.5 to 24.9 reflecting normal and 25 to 29.9 reflecting overweight was required for this study. The sample of at least 50 participants for each group provided an adequate
sample size (number of respondents) to test the hypotheses (Hair, Black, Babin, & Anderson, 2010).

The researcher via the Internet through Facebook recruited participants from college students throughout the United States. An advertisement was posted on a Facebook page created by the researcher solely to recruit participants. This Facebook advertisement included a message encouraging viewers to participate in the survey by clicking on the link provided in the message, served by SurveyMonkey. The Facebook page also explained the criteria necessary for participating in the study, and stated that, after completion of the questionnaire, all participants were eligible for a drawing for a prize of $100. Eligibility for the study was being of the age 18 years or older and being an enrolled college student in the United States. Eligible participants who were willing to participate would click on the provided URL, which was on the main Facebook page, and connected directly to the questionnaire provided on the server, SurveyMonkey. Then, the two filtering questions for eligibility were displayed. The first asked if they are college student in the United States. The second asked if they are 18 years of age or older. If they qualified, they moved on directly to the questionnaire. If they did not qualify, they were listed as filtered out, thanked for their participation through a pop-up message, and returned to the main Facebook page.

After the respondents completed the questionnaire, a separate Instant Win or Sweepstakes entry form page opened. Respondents were required to answer no additional or separate demographic questions. Survey participants could enter for a chance to win through this separate entry form while still keeping their survey responses anonymous. This section was optional. The researcher was only able to track the number of people
who had entered to win under the Reward’s Status and Summary in the collector. The prize partner, SurveyMonkey, was associated with ePrize. SurveyMonkey kept the registration information required by ePrize for the reward entry separate from the survey responses. EPrize would then randomly pick a winner and contact him or her to deliver the reward on the researcher’s behalf. The researcher monitored the server daily. The survey was anonymous and data was confidential. The questionnaire was accessible online at all times.

**Sample size.** According to Hair et al. (2010) for a comparative analysis statistical level of significance at $p=.05$ each category should have minimum of 50 observations per category. This study focused on two categories, normal and overweight category, with 18.5 to 24.9 BMI reflecting normal and 25 to 29.9 BMI reflecting overweight. These two categories had been self-selected due to researcher’s interest and time limitations. The researcher calculated the BMIs after each survey submitted and the surveying continued until the researcher collected 50 samples for each category. Recruitment continued online until a minimum sample of 100 (more than 50 for each category) had been collected. The college population used in this sample provided an adequate size to test the research hypotheses and answer the research questions for this study. A total of 201 surveys were collected however, incomplete surveys and participants within an underweight BMI category and within an Obese BMI category were not included.

**Setting.** The setting for data collection was virtual, as all surveys were administered through Survey Monkey. An advertisement created by the researcher was posted on the Facebook page solely for recruitment of participants. The Facebook advertisement included a message encouraging viewers to participate in the survey by
clicking on the link provided in the message, served by SurveyMonkey. The Facebook page also explained the criteria necessary to participate in the study, and stated that, after completion of the questionnaire, all participants were eligible to be entered in a drawing and had the opportunity to win $100. Participants who were willing participate would click on a link with the provided URL, which was on the main Facebook page, and connected directly to the questionnaire provided on the server, SurveyMonkey. Then, the two filtering questions for eligibility were displayed. The first asked if they were a college student in the United States. The second asked if they were 18 years of age or older. If they qualified, they moved on directly to the questionnaire. If they did not qualify, they were listed as filtered out, thanked for their participation through a pop-up message, and returned to the main Facebook page.

**Inclusion and Exclusion Criteria**

**Inclusion criteria.**

1. To be included in this study, individuals were required to be currently enrolled college student in the United States.

2. Participants were 18 years or older.

3. Read and wrote English.

4. Individual with a Facebook account.

**Exclusion criteria.**

1. Individuals who were not college students, including instructors, administrators, staff, visitors within the United States.

2. Those under 18 years of age.
3. Cannot read and write English.
4. Individuals without a Facebook account.

**Instrumentation**

Instrumentation consisted of a self-reported survey that measured variables and consisted of four parts.

**Part 1.** A personal characteristics profile had been developed by the researcher and included 7 items about age, gender, marital status, race, ethnicity, employment status, and level of college.

**Part 2.** Nutrition knowledge was measured by the Nutrition Knowledge Questionnaire design by Parmenter and Wardle (1999). This questionnaire was developed to analyze dietary and nutrition knowledge. Permission has been obtained to use the questionnaire in this study. It included 44 items in the categories of dietary recommendations, sources of nutrients, choosing everyday foods and diet-disease relationship (Parmenter & Wardle 1999).

**Part 3.** Dietary self-efficacy was measured using the Eating Habits Confidence Survey developed by Sallis, Pinski, Grossman, Patterson, and Nader (1988). Permission has been obtained to use the survey in this study. The Eating Habits Confidence Survey consisted of 20 items, measuring dietary self-efficacy.

**Part 4.** Body mass index was measured using two items, height (without shoes) in feet and inches, and weight (with clothes) in pounds. The researcher calculated the BMI using the BMI device provided by the Department of Health and Human Services’ National Institute of Health website at [http://www.nhlbisupport.com/bmi/](http://www.nhlbisupport.com/bmi/). BMI is a
measure of body fat based on height (without shoes) in feet and weight (with clothes) in pounds that applies to both adult men and women according to specific categories.

**Part 1: Personal characteristics profile.**

*Description.* The personal characteristics profile included questions regarding age in years, gender, marital status, race, ethnicity, employment status, student status, major, and level of college and academic achievement (See Appendix A, Part 1). Part 1 of the survey, developed by the researcher, contained a question for age, questions allowing for dichotomous responses for gender and ethnicity, and multiple-choice questions for race, marital status, employment status, and level of college.

**Part 2: Nutrition knowledge.**

*Description.* Nutrition knowledge is measured by the Nutrition Knowledge Questionnaire designed by Parmenter and Wardle (1999). The questionnaire was developed to analyze dietary and nutrition knowledge, and it included 44 questions that encompass current dietary recommendations, sources of nutrients, everyday food choices, and diet and disease relationships (See Appendix A, Part 2). According to the authors, these four areas underlie the main aspects of dietary and nutrition knowledge.

1. Do people know what current expert dietary recommendations are?
2. Do they know which foods provide the nutrients referred to in the recommendations?
3. Can they choose between different foods to identify the healthiest ones?
4. Do they know what the health implications of eating or failing to eat particular foods are?
Reliability and validity. Parmenter and Wardle (1999) conducted a study to test the reliability and validity of the Nutrition Knowledge Questionnaire. The study’s aim was to develop a psychometrically reliable and valid questionnaire that encompasses all aspects of practical nutrition knowledge, which can be replicated in future studies to examine the relationship between nutrition knowledge, demographic characteristics and dietary behavior (Parmenter & Wardle, 1999). Internal consistency was measured separately for the different sections, each of which pertaining to a different area of knowledge. The results of the study indicated that the minimum requirement for internal consistency has been recommended as $> 0.70$ (Parmenter & Wardle, 1999). Each section was calculated using Cronbach's alpha and the following results were attained: understanding of terms: 0.69; dietary recommendations: 0.76; sources of nutrients: 0.80, choosing everyday foods: 0.66; diet-disease relationships: 0.79. Overall the “internal consistency of each section was high (Cronbach's alpha $> 0.70$) and the test-retest reliability was also reflected as above the minimum requirement of 0.70 and nutrition experts scored significantly better than computer experts suggesting good construct validity” (Parmenter & Wardle, 1999, p. 300). Parmenter and Wardle’s (1999) study indicated that the instrument meet the psychometric criteria for reliability and construct validity. Cronbach's alpha will also be measured for nutrition knowledge from the studies data. Shepherd and Towler (1992), has also brought validated to the questionnaires in a study conducted eliciting information on nutrition knowledge and attitudes, related to fat intake from meat, meat products, dairy products and fried foods.
Part 3: Dietary self-efficacy.

Description. Dietary self-efficacy was measured utilizing Dietary Confidence Survey (Sallis et al., 1988). The Dietary Confidence Survey is a 20-item survey developed to measure the degree to which subjects are sure they can make dietary behavior changes (See Appendix A, Part 3). The scale measures self-efficacy for health-related behaviors including primarily diet exercise behaviors. Dietary confidence survey scale is based on a four point rating scale. Respondents rate the importance or accuracy of their reasons for their eating habits using a 4-point Likert scale with anchor ratings of 1 = “I know I cannot”, 2 = “Maybe I can”, 3 = “I know I can”, 4 = “Does not apply”.

Reliability and validity. Internal consistency reliability coefficients for Dietary Confidence Survey range from 0.83 to 0.85. Additionally, test–retest reliability for the Dietary and exercise confidence survey has been determined to be adequate (Sallis et al., 1988). The internal consistency of the multiple item scales will be measured in this study by the Cronbach’s coefficient alpha. The Cronbach’s coefficient alpha for each variable will be attenuated for an estimate equal to or higher than 0.70, which is the minimum threshold for internal consistency reliability in the Social Sciences. Cronbach's alpha will also be measured for dietary self-efficacy from the studies data.

Part 4: Body Mass Index.

Description. Body mass index (BMI) is a number calculated from a person's weight and height (See Appendix A, Part 4). BMI provides a reliable indicator of body fitness for most people and is used to screen for weight categories that may lead to health problems. As a measure of participant’s weight relative to participant’s height and waist circumference, BMI reflects abdominal fat and total body fat. It is a good indicator of
total body fat, which is the precursor needed to obtain information about an individual’s risk for developing obesity-associated diseases. BMI accounts for differences in body composition by defining the level of adiposity according to the relationship of weight to height, and therefore eliminating dependence on frame size. The scale indicates that, for people who are considered obese (BMI greater than or equal to 30) or those who are overweight (BMI of 25 to 29.9), and have two or more risk factors, the guidelines recommend weight loss. Even a small weight loss (just 10% of a person’s current weight) will help to lower risk of developing diseases associated with obesity. Research has indicated that individual who are overweight or obese have a greater chance of developing high blood pressure, high blood cholesterol or other lipid disorders, type 2 diabetes, heart disease, stroke, and certain cancers.

Reliability and validity. According to the National Institutes of Health (NIH) there are four standardized BMI categories: BMI below 18.5 is considered underweight, BMI between 18.5 to 24.9 is considered normal, BMI from 25.0 to 29.9 is considered overweight, and BMI of 30.0 and above is considered obese (HHS). Even though there are four categories of BMI, this study focused on two groups only, the normal (18.5 to 24.9) and overweight (25.0 to 29.9) categories. The inclusion of only these two categories was due to the primary interest of the researcher and also the limitation of time and resources. The researcher calculated the BMIs after each survey and the survey continued until the researcher collected 50 samples for each category.
Procedures: Ethical Considerations and Data Collection Methods

1. An application was submitted to the Lynn University Institutional Review Board (IRB) for approval.

2. Data collection began after IRB approval.

3. The data retrieval and recording required was approximately three months from the time of approval by the IRB of Lynn University.

4. The online survey was posted after the agreement with SurveyMonkey was completed.

5. The researcher monitored the server daily.

6. An advertisement was posted on a Facebook page created by the researcher solely for recruitment of participants.

7. After accepting the invitation to complete the survey, participants clicked on the provided link for a URL, which was posted on the main page of Facebook and were connected directly to the questionnaire on the server, SurveyMonkey.

8. After participants completed the questionnaire, a separate Instant Win or Sweepstakes entry form page opened and they had the choice to enter a drawing to win $100. No additional or separate demographic questions were used to collect the respondents’ information.

9. Eprize, who is the prize partner of SurveyMonkey, randomly picked the winner and contacted him or her to deliver the reward on the researcher’s behalf.

10. The survey took approximately 15 minutes to complete.

11. Confidentiality of survey data were maintained and was accessible only by a username and password that the research alone knew.
12. The researcher was only able to track the number of people who had entered to
win under the Reward’s Status and Summary collector.

13. An IRB Form 8 (Termination of Study) was submitted to the IRB of Lynn
University after completion of data collection.

The sample consisted of college students, including males and females, ages 18 and
older, recruited online from various colleges throughout the United States. The sample
size was 126. The sampling plan was a convenience sample, and participants were
recruited through Facebook. This study focused on normal and overweight groups with
18.5 to 24.9 BMI, reflecting normal weight, and 25 to 29.9 BMI, reflecting overweight.
The researcher calculated the BMIs and the surveying continued until the researcher
collected 50 samples for each category (normal and overweight).

One survey instrument was administered to collect all the data. The survey took
approximately fifteen minutes to complete. The researcher has obtained the required
permission from the instrument developers to use all the scales and figures in the study.
The researcher via the Internet through Facebook recruited all participants for college
students throughout the United States. Computer data was stored only on the researcher
computer, which required a password that only the research knew.

The instrumentation consisted of a self-reported survey that measured variables in
four parts. Part 1, personal characteristics, included questions about age, gender, marital
status, race, ethnicity, employment status, and level of college. Part 2, nutrition
knowledge, was measured by the Nutrition Knowledge Questionnaire. Part 3, dietary
self-efficacy, was measured using the Eating Habits Confidence Survey. Part 4, body
mass index, was measured using height (without shoes) in feet and inches and weight (with clothes) in pounds.

**Methods of Data Analysis**

All data collected from the sample was analyzed using the Statistical Package for Social Science (SPSS) for Windows version 18.0. Statistical procedures for responding to research questions and testing research hypotheses in this study included descriptive statistics and t-test. The following data procedure and steps were incorporated:

1. **Data Coding:** Survey was coded with numbers for levels of each response category and each variable.

2. **Exploratory Factor Analysis (EFA):** Factor analysis was conducted for each scale.

3. **Internal Consistency Reliability:** Variables consist of items measured with multiple rating scales. The internal consistency of the multiple item scales was measured by the Cronbach’s coefficient alpha. The Cronbach’s coefficient alpha of each variable was attended for an estimate equal to or higher than 0.70, which is the minimum threshold for internal consistency reliability in the Social Sciences.

The table presents a summary of the measurements and variables in the study. The table also displays the instrument used and the corresponding number of items the survey includes.
### Table 3-1

*Constructs in the Survey and measurements*

<table>
<thead>
<tr>
<th>Part</th>
<th>Construct</th>
<th>Instrument Name and Developer (s)</th>
<th>Measures</th>
<th>Number of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Personal Characteristics</td>
<td>Developed by Researcher</td>
<td>Multiple Choice:</td>
<td>7 items</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Age</td>
<td>1 item</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gender</td>
<td>1 item</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ethnicity</td>
<td>1 item</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Marital status</td>
<td>1 item</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Race</td>
<td>1 item</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Employment status</td>
<td>1 item</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Level of college</td>
<td>1 item</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dietary recommendations</td>
<td>4 items</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sources of nutrients</td>
<td>8 items</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Choosing everyday foods</td>
<td>22 items</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Diet-disease relationships</td>
<td>10 items</td>
</tr>
<tr>
<td>3</td>
<td>Dietary Self-efficacy</td>
<td>Dietary &amp; Confidence Survey Sallis (1988)</td>
<td>4-Point Likert Rating Scale:</td>
<td>20 items</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Self-efficacy and eating habits</td>
<td>20 items</td>
</tr>
<tr>
<td>4</td>
<td>BMI</td>
<td></td>
<td>Fill in the Blank:</td>
<td>2 items</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Height</td>
<td>1 item</td>
</tr>
</tbody>
</table>
Methods of data analysis for research hypothesis testing. Descriptive statistics of the sample was used to describe the sample’s characteristics, which included age, gender, marital status, race, ethnicity, employment status, and level of college. Mean scores, frequency distribution, percentage of responses for each variable, and variability (standard deviation) were conducted. For Hypothesis 1, which posits that there are significant differences in BMI for normal and overweight college students according to their personal characteristics, for categorical data chi-square with the significant level of $p < .05$ was used to compare personal characteristics of the students to BMIs for normal and overweight students. Research Hypothesis 1, was tested to answer Research Question 1 which states that there are significant differences in BMI for normal and overweight college students according to their personal characteristics.

To test Research Hypothesis 2, which posits that there are significant differences in BMI for normal and overweight college student according to their nutrition knowledge, independent $t$-tests with the significant level of $p < .05$ was used to compare the mean differences in BMI for normal and overweight according to nutrition knowledge. Research Hypothesis 2 was tested to answer Research Question 2, which

<table>
<thead>
<tr>
<th>Part</th>
<th>Construct</th>
<th>Instrument Name and Developer (s)</th>
<th>Measures</th>
<th>Number of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Items</td>
<td></td>
<td>Weight</td>
<td>1 item</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>73 items</td>
<td></td>
</tr>
</tbody>
</table>

Table 3-1 continued
states there are significant differences in BMI for normal and overweight college students according to their nutrition knowledge.

To test Research Hypothesis 3, which posits that there are significant differences in BMI for normal and overweight college students according to their dietary self-efficacy, independent t-tests with the significant level of $p < .05$ was used to compare the mean differences in BMI for normal and overweight participants according to dietary self-efficacy. Research Hypothesis 3 was tested to answer Research Question 3, which states there are significant differences in BMI for normal and overweight college students according to their dietary self-efficacy.

**Methods of data analysis for research questions.** Descriptive statistics were used to describe the entire sample for personal characteristics, which included, age, gender, marital status, race, ethnicity, employment status, and level of college. Mean scores on scales, frequency distribution, percentage of response for each variable, and variability (such as standard deviation) were conducted. For Research Question 1, which asks are there significant differences in BMI for normal and overweight college students according to their personal characteristics, chi-square with the significant level of $p < .05$ was used to compare personal characteristics of the students to BMIs for normal and overweight students.

For Research Question 2, which asks if there are any significant differences in BMI for normal and overweight college students according to their nutrition knowledge, Research Hypothesis 2 was tested employing independent t-tests with the significant level of $p < .05$ which will be used to compare BMI for normal and overweight and nutrition knowledge.
For Research Question 3, which asks whether there are any significant differences in BMI for normal and overweight college students according to their dietary self-efficacy, Research Hypothesis 3 was tested employing independent \( t \)-tests with the significant level of \( p < .05 \) was used to compare BMI for normal and overweight students and dietary self-efficacy.

In this study, descriptive statistics of all variables were presented. Inferential statistics were utilized to test research hypotheses. Reliability estimates were determined using coefficient alphas. Criterion-related validity will be established using a \( p < .05 \) significance level.

**Data coding.** Data coding were performed for each sections of the survey.

Part 1 describes personal characteristics and were coded as follows; question 1, Age in years: 18-25 = 1, 26-30 = 2, 31-34 = 3, 35 and older = 4; question 2, Gender: Male = 1, and Female = 2; question 3, Marital Status: Married = 1, Single, Never married = 2, Divorced or Separated = 3 and Widow or Widower = 4; question 4, Race: White = 1, Black or African American = 2, American Indian or Alaska Native = 3, Asian = 4, and Native Hawaiian or Pacific Islander = 5; question 5, Ethnicity: Not Hispanic or Latino = 1, and Hispanic or Latino = 2; question 6, Employment Status: Currently not working = 1, Currently employed (Part-time, < 40 hours weekly) = 2, and Currently employed (Full-time ≥ 40 hours weekly) = 3; question 7, Level of College: Freshman (< 30 credits) = 1, Sophomore (< 60 credits) = 2, Junior (< 90 credits) = 3, and Senior (> 90 credits) = 4.

Part 2 describes nutrition knowledge and contains questions 8 through 51, which will be coded as follows: question 8: More = 1, Same = 2, Less = 3, and Not sure = 4; questions 9, 21, 25, 26, 30-33, 36, and 38-41: a = 1, b = 2, c = 3, and d = 4; questions 10, 27, and 49: a
questions 11 through 17: High=1, Low=2, and Not sure=3; questions 18, 20, 22-24, 28, 37, 43-46: a = 1, b = 2, and c = 3; questions 19, 47, 48, and 51: Yes = 1, No = 2, and Not sure = 3; questions 34, 35, and 50: a = 1 and b = 2.

Part 3 describes dietary self-efficacy and contains questions 52 through 71, which were coded as follows: I know I cannot = 1, Maybe I can = 2, I know I can = 3, and Does not apply = 4. Part 4 describes question 72 reporting height and question 73 reporting weight, which were used to calculate BMI and were coded as follows: BMI of Normal = 1, and BMI of Overweight = 2.

Classification of body mass index. Body mass index (BMI) is a number that can be calculated from a person’s weight and height. BMI provides a reliable indicator of body fatness for most people and was used in this study to screen for a normal weight category and an overweight category. The calculated BMI score is valid for both men and women and is categorized as follows:

Underweight ≤ 18.5
Normal weight = 18.5-24.9
Overweight = 25-29.9
Obesity ≥ 30

In this study the two categories of BMI that were used are normal weight, ranging from 18.5 to 24.9, and overweight, ranging from 25.0 to 29.9.
Evaluation of Research Methods

The internal and external validity of this study was addressed below by a review of the strengths and weaknesses in research design, population and sampling, measurement, and the method of data analysis.

Internal Validity

Strengths.
1. Statistical procedures were appropriate for answering research questions and testing research hypothesis.

2. The concepts in existing theoretical models had received prior empirical support.

3. Adapted instruments were standardized measures previously tested on diverse populations and shown to reflect acceptable alphas in prior studies.

4. The estimated sample size was adequate to conduct the study.

Weaknesses.
1. A non-experiment design poses a threat to internal validity and may be weaker than an experimental design.

2. A comparative study is not the strongest research design that lacks casual relationships.

External Validity

Strengths.
1. Estimates of internal consistency, reliability, and factor analysis were conducted prior to statistical analysis.
2. Data collection occurred in a virtual setting online, not in a laboratory setting. The survey was completed in a natural environment.

Weaknesses.

1. A non-probability sampling plan was used (self-selected, self-reported and convenience) that is not generalizable.

2. Self-selective sampling bias of those who agree to participate may not represent the accessible population and affect generalizability.

3. Including part-time and full-time students will not provide results for either enrollment classification status.
CHAPTER IV
RESULTS

Chapter 4, presents the findings of the examined differences in the body mass index of normal and overweight college students in the sample of college students in this study according to their personal characteristics, nutrition knowledge, and dietary self-efficacy. The data collected from the online surveys were analyzed using the Statistical Program for the Social Sciences (SPSS) version 18.0. A description of the final data-producing sample, answers to the research questions, testing of the hypotheses, and other findings are included in Chapter 4.

Descriptive Analysis of Sample

Table 4-1 presents the descriptive statistics of normal and overweight body mass index according to the personal characteristics of college students in this study.

<table>
<thead>
<tr>
<th>Student Characteristics</th>
<th>Normal BMI Students</th>
<th>Overweight BMI Students</th>
<th>Total Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
<td>Number</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>50.8</td>
<td>62</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-25</td>
<td>18</td>
<td>14.3</td>
<td>23</td>
</tr>
<tr>
<td>26-30</td>
<td>32</td>
<td>25.4</td>
<td>21</td>
</tr>
<tr>
<td>31-34</td>
<td>12</td>
<td>9.5</td>
<td>12</td>
</tr>
<tr>
<td>35 and Older</td>
<td>2</td>
<td>1.6</td>
<td>6</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>22</td>
<td>17.5</td>
<td>36</td>
</tr>
<tr>
<td>Female</td>
<td>42</td>
<td>33.3</td>
<td>26</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>20</td>
<td>15.9</td>
<td>42</td>
</tr>
<tr>
<td>Single, Never Married</td>
<td>36</td>
<td>28.6</td>
<td>68</td>
</tr>
<tr>
<td>Divorced or Separated</td>
<td>8</td>
<td>6.3</td>
<td>14</td>
</tr>
<tr>
<td>Widow or Widower</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
</tr>
</tbody>
</table>
A total of 201 surveys were completed online via Survey Monkey. However 75 of those surveys were not included due to incomplete surveys or they did not meet the criteria of the study. A total of 126 college students met the criteria and was included in the study. Based on the results of the online survey, 68 were males and 58 were females. See Table 4-1. The least amount of students (n=8) (6.3%) were thirty five years and older, while (32.5%) ranged from ages eighteen through twenty-five years old, (42.1%) ranged between twenty-six and thirty years old and (19.0%) ranged between thirty-one and thirty-four years old. Sixty-eight of the students were single (54.0%) and had never been married, while forty-two students (33.3%) were married, eight (11.1%) were

### Table 4-1 Continued

<table>
<thead>
<tr>
<th>Student Characteristics</th>
<th>Normal BMI Students</th>
<th>Overweight BMI Student</th>
<th>Total Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
<td>Number</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>26</td>
<td>20.6</td>
<td>22</td>
</tr>
<tr>
<td>Black or African</td>
<td>23</td>
<td>18.3</td>
<td>27</td>
</tr>
<tr>
<td>American</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian or Alaskan</td>
<td>7</td>
<td>5.6</td>
<td>9</td>
</tr>
<tr>
<td>Asian</td>
<td>4</td>
<td>3.2</td>
<td>3</td>
</tr>
<tr>
<td>Native Hawaiian/Pacific</td>
<td>4</td>
<td>3.2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Hispanic</td>
<td>50</td>
<td>39.7</td>
<td>44</td>
</tr>
<tr>
<td>Hispanic</td>
<td>14</td>
<td>11.1</td>
<td>18</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Currently Not Working</td>
<td>23</td>
<td>18.3</td>
<td>30</td>
</tr>
<tr>
<td>Employed Part Time</td>
<td>32</td>
<td>25.4</td>
<td>23</td>
</tr>
<tr>
<td>Employed Full Time</td>
<td>9</td>
<td>7.1</td>
<td>9</td>
</tr>
<tr>
<td><strong>College Level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>24</td>
<td>19.0</td>
<td>20</td>
</tr>
<tr>
<td>Sophomore</td>
<td>26</td>
<td>20.6</td>
<td>18</td>
</tr>
<tr>
<td>Junior</td>
<td>11</td>
<td>8.7</td>
<td>13</td>
</tr>
<tr>
<td>Senior</td>
<td>3</td>
<td>2.4</td>
<td>11</td>
</tr>
</tbody>
</table>
divorced or separated and two (1.6%) were widow or widower. The majority of the student's races were either White (38.1%) or Black or African American (39.7%), the least were American Indian or Alaskan (12.7%), Asian (5.6%), or Native Hawaiian or Pacific Islander (4.0%). Only fourteen students (25.4%) were Hispanic. Most of the students (43.7%) were employed part-time, or currently not working (42.1%), and (14.3%) were employed full-time. The students tended to be either freshmen or sophomores in academic level, (34.9%) were Freshmen and (34.9%) were Sophomores, only (19.0%) and (11.1%) were Junior and senior in academic level, respectively.

**Personal Characteristics and BMI**

Table 4-2 presents the personal characteristic of the sample according to normal and overweight body mass index

<table>
<thead>
<tr>
<th>Student Characteristics</th>
<th>Mean Statistics</th>
<th>Std. Deviation</th>
<th>Skewness Statistics</th>
<th>Std. Error</th>
<th>Kurtosis Statistics</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>1.97</td>
<td>.776</td>
<td>.475</td>
<td>.299</td>
<td>-.092</td>
<td>.590</td>
</tr>
<tr>
<td>Overweight</td>
<td>2.02</td>
<td>.983</td>
<td>.608</td>
<td>.304</td>
<td>-.663</td>
<td>.599</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>1.66</td>
<td>.479</td>
<td>-.674</td>
<td>.299</td>
<td>-1.597</td>
<td>.590</td>
</tr>
<tr>
<td>Overweight</td>
<td>1.42</td>
<td>.497</td>
<td>.335</td>
<td>.304</td>
<td>-1.952</td>
<td>.599</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>1.81</td>
<td>.639</td>
<td>.182</td>
<td>.299</td>
<td>-1.570</td>
<td>.590</td>
</tr>
<tr>
<td>Overweight</td>
<td>1.81</td>
<td>.743</td>
<td>.826</td>
<td>.304</td>
<td>.872</td>
<td>.599</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>2.02</td>
<td>1.161</td>
<td>1.224</td>
<td>.299</td>
<td>.820</td>
<td>.590</td>
</tr>
<tr>
<td>Overweight</td>
<td>1.94</td>
<td>.921</td>
<td>1.042</td>
<td>.304</td>
<td>1.148</td>
<td>.599</td>
</tr>
</tbody>
</table>
Descriptive statistics presented in Table 4-2, were used to describe the entire sample for personal characteristics, which included, age, gender, marital status, race, ethnicity, employment status, and level of college. Mean scores on scales, frequency distribution, percentage of response for each variable, and variability (standard deviation) were also conducted. Data coding were performed for each sections of the survey. Age in years was coded as followed: 18-25 = 1, 26-30 = 2, 31-34 = 3, 35 and older = 4. The mean statistics for personal characteristic indicated that most of the college students who were of a normal BMI weight were between the ages of 18-25 years (1.97). However the overweight BMI category tended to be college students between the ages of 26-30 years (2.02). Gender was coded as followed Male = 1, and Female = 2. For gender within the normal BMI category most students were female (1.66) and for the overweight BMI category most of the students were male (1.42). Marital Status was coded as followed Married = 1, Single, Never married = 2, Divorced or Separated = 3 and Widow or Widower = 4. According to their marital status profile, within the normal BMI category,
most students were single, never married (1.81) and for the overweight BMI category most of the students were also single, never married (1.81). Race was coded as followed: White = 1, Black or African American = 2, American Indian or Alaska Native = 3, Asian = 4, and Native Hawaiian or Pacific Islander = 5. For race within the normal BMI category most students were Black or African American (2.02) and for the overweight BMI category most of the students were white (1.94). Ethnicity was coded as followed: Not Hispanic or Latino = 1, and Hispanic or Latino = 2. Ethnicity within the normal BMI category indicated that most students were not Hispanic or Latino (1.22) and within the overweight BMI category most of the students were also Hispanic or Latino (1.29). Employment Status was coded as followed: Currently not working = 1, Currently employed (Part-time, < 40 hours weekly) = 2, and Currently employed (Full-time > 40 hours weekly) = 3. Employment within the normal BMI category most students were employed part-time (1.78) and for the overweight BMI category most of the students were also employed part-time (1.66). Level of College were coded as followed: Freshman (< 30 credits) = 1, Sophomore (< 60 credits) = 2, Junior (< 90 credits) = 3, and Senior (> 90 credits) = 4. For college level within the normal BMI category most students were freshmen (1.42) while in the overweight BMI category most of the students were sophomore (2.24).
Table 4-3 presents the differences in BMI categories (normal body mass index and overweight body mass index) according to personal characteristics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Chi-square Value</th>
<th>df</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>126</td>
<td>.182</td>
<td>3</td>
<td>.196</td>
</tr>
<tr>
<td>Gender</td>
<td>126</td>
<td>.008*</td>
<td>1</td>
<td>.006</td>
</tr>
<tr>
<td>Marital Status</td>
<td>126</td>
<td>.460</td>
<td>3</td>
<td>.556</td>
</tr>
<tr>
<td>Race</td>
<td>126</td>
<td>.589</td>
<td>4</td>
<td>.607</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>126</td>
<td>.356</td>
<td>1</td>
<td>.415</td>
</tr>
<tr>
<td>Employment</td>
<td>126</td>
<td>.306</td>
<td>2</td>
<td>.322</td>
</tr>
<tr>
<td>College Level</td>
<td>126</td>
<td>.089</td>
<td>3</td>
<td>.088</td>
</tr>
</tbody>
</table>

Note: * (p < 0.05) indicates a significant difference

For categorical variables, Chi-square analysis was used to compare differences in BMI categories (normal body mass index and overweight body mass index) according to personal characteristics which are presented in Table 4-3. Research Hypothesis 1 was tested employing Chi-square to compare differences in BMI category (normal and overweight) of college students according to personal characteristics (age, gender, marital status, race, ethnicity, employment, college level) at (p<0.05). The results indicated that there was a significant difference between BMI of male and female students, (p <0.008). There was not a significant differences between BMIs based one other personal characteristic at (p<0.05). Research Hypothesis 1, was tested to answer Research Question 1 which states that there are significant differences in BMI of normal and overweight college students based on gender.
Nutrition Knowledge and BMI

Table 4-4 illustrates the reliability between the items on the survey instrument, Cronbach’s alpha statistics were computed for each underlying variable. A reliability analysis is presented in Table 4-4 for nutrition knowledge and dietary self-efficacy questionnaire.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Items</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition Knowledge</td>
<td>44</td>
<td>.909</td>
</tr>
<tr>
<td>Dietary Self-Efficacy</td>
<td>20</td>
<td>.701</td>
</tr>
</tbody>
</table>

Internal consistency reliability was measured for both dietary self-efficacy and nutrition knowledge as both variables consisted of items measured with multiple rating scales. The internal consistency of the multiple item scales was measured by the Cronbach’s coefficient alpha. The Cronbach’s coefficient alpha of each variable was attended for an estimate equal to or higher than 0.70, which is the minimum threshold for internal consistency reliability in the Social Sciences. It was found that the questions on the survey instrument did measure the variables that they were intended to measure.

For the purpose of this study, the reliability coefficients were computed using only the questions that were provided on the survey instrument for the nutrition knowledge and dietary self-efficacy survey. Based on the internal consistency/reliability measurements using Cronbach’s alpha statistics, it was observed that two of the underlying variables that were being measured by the survey instrument resulted in reliable estimates. For the 20-item, Part 3 of the questionnaire, for Dietary Self-efficacy section, the internal consistency reliability was calculated using Cronbach’s alpha. This coefficient was observed to be equal to .701 (dietary self-efficacy). For the 44-item, Part
2 of the questionnaire, for Nutrition Knowledge section, the internal consistency reliability was calculated using Cronbach’s alpha. The highest coefficient was observed with an alpha coefficient of .909 (nutrition knowledge). This indicated that the questions used on the survey instrument did measure the desired constructs with an alpha of greater than 0.70 (Nunnally and Bernstein, 1994).

Table 4-5 shows significant differences between BMI for normal and overweight according to their nutrition knowledge.

<table>
<thead>
<tr>
<th>Item</th>
<th>Normal BMI Students Mean</th>
<th>Overweight BMI Students Mean</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Dietary Recommendations</td>
<td>11.546</td>
<td>11.548</td>
<td>-0.001*</td>
</tr>
<tr>
<td>Total Sources of Foods</td>
<td>27.25</td>
<td>26.27</td>
<td>0.97**</td>
</tr>
<tr>
<td>Total Choosing Everyday Foods</td>
<td>3.37</td>
<td>3.33</td>
<td>0.03*</td>
</tr>
<tr>
<td>Total Diet-Disease Relationships</td>
<td>11.54</td>
<td>10.32</td>
<td>1.22**</td>
</tr>
<tr>
<td>Total Nutrition Knowledge Questionnaire</td>
<td>53.71</td>
<td>51.48</td>
<td>2.23**</td>
</tr>
</tbody>
</table>

Note: * (p < 0.05) indicates a significant difference and ** (p > 0.70) significant similarity.

For the purpose of this study, body mass index outcomes for normal and overweight college students were determined by two measures – nutrition knowledge and dietary self-efficacy. Table 4-5 presents the results which test Research Hypothesis 2, which posits that there are significant differences in BMI for normal and overweight college student according to their nutrition knowledge. Independent t-tests was used to compare at the significant level of (p <.05) according to the mean differences BMI for normal and overweight according to nutrition knowledge. There were two items,
indicating significant differences at (p < 0.05). "Total Dietary Recommendations" shows a significant difference at (p < 0.05) of (-0.001). College students within a normal BMI category (BMI between 18.5 to 24.9), were much more likely to, know and understand what current experts dietary recommendations were to be healthy, more than college students within an overweight BMI category (BMI of 25 to 29.9). The second factor "Total Choosing Everyday Foods" indicated a significant difference at (p < 0.05) of (p<0.03). College students within a normal BMI category (BMI between 18.5 to 24.9), were much more likely to, choose between different foods to identify the healthiest ones, more than college students within an overweight BMI category (BMI of 25 to 29.9). Three items (Total Sources of Foods, Total Diet-Disease Relationships and Total Nutrition Knowledge Questionnaire) which had similarities (p > 0.70) between the two groups. Research Hypothesis 2, stating there are significant differences in BMI for normal and overweight college students according to their nutrition knowledge was tested.
Dietary Self-efficacy and BMI

Table 4-6, shows a comparison of the findings between Normal and Overweight BMI’s of College Students and Dietary Self-Efficacy.

<table>
<thead>
<tr>
<th>Item</th>
<th>Normal BMI Students Mean</th>
<th>Overweight BMI Students Mean</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Eating Habits Survey- Resisting Relapse</td>
<td>11.12</td>
<td>10.75</td>
<td>0.36**</td>
</tr>
<tr>
<td>Total Eating Habits Survey-Reducing Calories</td>
<td>11.12</td>
<td>10.45</td>
<td>0.67**</td>
</tr>
<tr>
<td>Total Eating Habits Survey- Reducing Salt</td>
<td>10.87</td>
<td>10.56</td>
<td>0.31**</td>
</tr>
<tr>
<td>Total Eating Habits Survey- Reducing Fat</td>
<td>11.48</td>
<td>10.38</td>
<td>1.09**</td>
</tr>
<tr>
<td>Total Dietary Self Efficacy- Eating Habits Survey</td>
<td>42.34</td>
<td>40.38</td>
<td>1.95**</td>
</tr>
</tbody>
</table>

Note: * (p < 0.05) indicate a significant difference and ** (p > 0.70) significant similarity.

The dietary self-efficacy scale measures self-efficacy for health-related behaviors. Dietary confidence survey scale is based on a four point rating scale. Respondents rate the importance or accuracy of their reasons for their eating habits using a 4-point Likert scale with anchor ratings of 1 = “I know I cannot”, 2 = “Maybe I can”, 3 = “I know I can”, 4 = “Does not apply”. Research Hypothesis 3 was tested employing independent t-tests with the significant level of (p < 0.05). Research Hypothesis 3 states there are significant differences in BMIs of normal and overweight college students according to their dietary self-efficacy. There were no single items, indicating significant differences at (p < 0.05). However all the items (Total Eating Habits Survey- Resisting Relapse, Total Eating Habits Survey-Reducing Calories, Total Eating Habits Survey- Reducing Salt, Total Eating Habits Survey- Reducing Fat, and Total Dietary Self Efficacy- Eating Habits Survey) had similarities (p > 0.70) between the two groups. Research Hypothesis 3 was
tested to answer Research Question 3, which asks whether there are any significant
differences in BMI for normal and overweight college students according to their dietary
self-efficacy.

Chapter 4 presented the findings of the study after testing the three research
hypothesis and answering three research questions about the (personal characteristics,
nutrition knowledge, and dietary self-efficacy) factors influencing body mass index of
normal and overweight college students. The result finds that only gender was significant
in personal characteristics for (H1). However, both Total Dietary Recommendations and
Total Choosing Everyday Foods were significant factors in nutrition knowledge
understanding (H2). However, there was no single factor in dietary self-efficacy that was
significant for (H3). Chapter 5 will discuss the findings.
CHAPTER V

DISCUSSION AND CONCLUSIONS

Discussion

Chapter 5 presents a discussion of the results. This study examined the differences in the body mass index of normal and overweight college students in the United States according to their personal characteristics, nutrition knowledge, and dietary self-efficacy. This was accomplished by using a non-experimental quantitative exploratory (comparative) research design that collected information from participants via an online questionnaire. This chapter provides a discussion of the results from Chapter 4 within the framework of the past literature. In this way, the research questions will be answered in order to gain a better understanding about the factors influencing the body mass index of normal and overweight college students in the United States. The research questions are discussed in relation to the major theories and past empirical studies. The conclusions drawn about these questions will help to better understand and explain how certain factors can influence a college student’s body mass index.

Chapter 5 presents a summary and interpretations of the findings followed by the practical implications, conclusions, limitations, and recommendations for future study.

Interpretations

Many studies have been conducted to analyze the effects of nutrition knowledge and body mass index as related to weight and obesity in the United States. However, there are limited, if any, reported studies that have investigated nutrition knowledge and dietary self-efficacy, particularly in reference to college students. This study has
combined and examined all three variables, nutrition knowledge and dietary self-efficacy using body mass index in college students in particular and in the United States.

There were three hypotheses tested in this study. Personal characteristics (age, gender, marital status, race, ethnicity, and employment) information was gathered to investigate how they affect a college student's body mass index. In particular, this study focused on two categories of BMI normal weight, ranging from 18.5 to 24.9, and overweight, ranging from 25.0 to 29.9. In addition, nutrition knowledge and dietary self-efficacy were observed in the study to see how these variables could affect college students' body mass index.

The internal consistency reliability coefficient for this study for the nutrition knowledge scale when tested had a Cronbach's alpha of 0.701. This indicated that the question used on the survey instrument for nutrition knowledge did measure the desired constructs with an alpha of greater than 0.70 (Nunnally and Bernstein, 1994). These results were comparable with results and findings from Parmenter and Wardle's, 1999 study that resulted in an internal consistency of Cronbach's alpha 0.70 - 0.97. Their study indicated that the test-retest reliability was above the minimum requirement of 0.70. The authors concluded “that the instrument meets psychometric criteria for reliability and construct validity and provides a useful scale with which to reassess the relationship between knowledge” (Parmenter & Wardle, 1999, p. 301-302).

To measure self-efficacy, twenty items from Sallis, Pinski, and Grossman, 1988, dietary self-efficacy scale were included in this study resulting in a Cronbach’s alpha of 0.701. This indicated that the questions used on the survey instrument did measure the desired constructs with an alpha of greater than 0.70 (Nunnally and Bernstein, 1994). The
results in this study were comparable with results and findings from Sallis, Pinski, & Grossman's, 1988 study and the internal consistency reliability coefficients range from 0.83 to 0.85 for the dietary self-efficacy questionnaire when measured in prior studies (Sallis, Pinski, & Grossman, 1988). Additionally, the researchers confirmed that test-retest reliability for the dietary and exercise confidence survey had been determined to be adequate (Sallis, Pinski, & Grossman, 1988).

Personal Characteristics and Body Mass Index

The first hypothesis was as follows:

**Hypothesis 1. There are significant differences in BMIs of normal and overweight college students according to their personal characteristics.**

According to the findings, Hypothesis 1 was partially supported. The current study findings showed that gender was the only significant personal characteristics that influence the body mass index for normal and overweight college students. The analysis revealed that there was a significant difference between BMI and gender, \( p < 0.008 \) indicating that female college students had a lower body mass index than male students. There were no other personal characteristics that reflected a significant factor because all \( p \) values were higher than 0.05 (H1). Personal characteristics of normal and overweight college students were not significantly different for age, marital status, race, ethnicity, employment status, and level of college for this study. However, the literature has reported that personal characteristics, such as gender, race, and age, have had statistically significant effects on the level of engagement in health promoting behaviors and lifestyle
Nutrition Knowledge and Body Mass Index

The second hypothesis was as follows:

**Hypothesis 2. There are significant differences in BMIs of normal and overweight college students according to their nutrition knowledge.**

The findings indicated that Hypothesis 2 was partially supported. There were two items, indicating significant differences at \( p < 0.05 \). “Total Dietary Recommendations” shows a significant difference of (-0.001). College students within a normal BMI category (BMI between 18.5 to 24.9) were much more likely to know and understand what current experts say about healthy dietary recommendations. However, college students within an overweight BMI category (BMI of 25 to 29.9) were less likely to know and understand what current experts say in terms of a healthy diet. The second factor, “Total Choosing Everyday Foods” indicated a significant difference of \( p < 0.03 \). The results showed that college students within a normal BMI category (BMI between 18.5 to 24.9), were much more likely to, choose between different foods to identify the healthiest choices, over college students within an overweight BMI range (BMI of 25 to 29.9). Three items (Total Sources of Foods, Total Diet-Disease Relationships and Total Nutrition Knowledge Questionnaire) had similarities at \( p > 0.70 \) between the two groups.

Parmenter and Wardle (1999) used the Nutrition Knowledge Questionnaire in past studies to measure nutrition knowledge (Parmenter & Wardle, 1999). The questionnaire was developed to be a reliable and valid questionnaire covering all aspects of practical
nutrition knowledge which could be used in future studies to look at the relationship between nutrition knowledge, demographic characteristics and dietary behavior (Parmenter & Wardle, 1999). They found that dietary behavior is complex to understand when relating to nutrition knowledge and hence a clear understanding of knowledge needs to be assigned first. The results indicated that students tended either to concentrate on a specific area of knowledge such as, fat or cholesterol, or covered a wide variety of knowledge. The study was unable to gain a systematic and true understanding of what people know. The study concluded that the lack of a psychometric validation of measures, may explain the variability of the results of studies looking at the knowledge-behavior relationship in the area of nutrition.

One of the implications that may have affected the outcomes of the results of the questionnaire is that the questionnaire was originated and tested in the United Kingdom. Some of the foods in the questionnaire are culturally specific foods and may have not been familiar to participants in the United States. This would affect the understanding of the questions. These types of questions were very prominent in two sections in the questionnaire in particular, “Total Sources of Foods,” and “Total Nutrition Knowledge Questionnaire “which may have led to different results. The participants may have not fully understood what was being asked. Empirical studies have found that dietary patterns are influenced by socio-cultural and other demographic and lifestyle factors. Furthermore, relationships among certain foods or combinations of foods may be associated with specific disease risks (Boreham, Savage, Drimrose, Gran & Strain, 1993; Park, Murphy, Wilkens, Yamamoto, Sharmas, Hankin, Henderson, & Kolonel, 2005; United States Department of Agriculture (USDA), 1995).
Numerous studies have found that nutrition education enables people to make informed decisions and therefore improves their BMI and health (Anding et al., 2001; Byrd-Bredbenner et al., 1998; Fine et al., 1994; Huang et al., 2003; Jackson et al., 2007; Matvienko et al., 2001; Lewis & Schafer, 2001). This study also supported these findings, testing Hypothesis 2 which confirmed that nutrition knowledge is an important influencing factor in total health and the BMI of normal and overweight students.

**Dietary Self-Efficacy and Body Mass Index**

The third hypothesis was as follows:

**Hypothesis 3. There are significant differences in BMIs of normal and overweight college students according to their dietary self-efficacy.**

Based on the results from this study, Hypothesis 3 was not supported. This study, found no relation between (Total Eating Habits Survey- Resisting Relapse, Total Eating Habits Survey- Reducing Calories, Total Eating Habits Survey- Reducing Salt, Total Eating Habits Survey- Reducing Fat, and Total Dietary Self Efficacy- Eating Habits Survey) of normal and overweight college students. Therefore, this study results showed that there was no relationship between measures of self-efficacy and the likelihood to stick to a particular health-related behavior and body mass index categories (normal BMI and overweight BMI).

Dietary self-efficacy has been measured previous utilizing Dietary Confidence Survey (Sallis et al., 1988). Their study found self-efficacy factors were significantly associated with reported diet and exercise behaviors. The scale measures self-efficacy for health-related behaviors including primarily diet exercise behaviors. The Dietary
Confidence Survey scale is based on a four-point rating scale. Respondents rate the importance or accuracy of their reasons for their eating habits using a 4-point Likert scale with anchor ratings of 1= “I know I cannot”, 2= “Maybe I can”, 3 = “I know I can”, 4 = “Does not apply”.

One limitation of the dietary self-efficacy survey is the self-reporting used to determine the participants own self reflected attitudes. No direct observation was used in the application of this attitude or feeling based survey. Only self-reported information was used. Self-reported data is not necessarily always accurate. Studies have indicated that in order to predict specific behavior, attitudes, and intention, the participant must be in agreement and understand concepts of action, target, context, and time.

However, study findings throughout the literature continue to confirm that self-variables, health self-efficacy, and health values have been significant predictors of engagement in health promoting lifestyles among college students (Jackson et al., 2007; Luquis et al., 2003; McAthur et al., 2002). Notably, health behaviors have been shown to be a function of value attached to good health outcomes and personal beliefs (e.g., self-efficacy) (Jackson et al., 2001; Jett et al., 1998; Zweig et al., 2001).

**Practical Implications**

Nutrition and applied nutrition knowledge in relation to health-related diseases, health and wellness have become a topic of global interest. This study provided a better understanding of how various factors can influence body mass index and over health. More specific differences between these variables (personal characteristics, nutrition knowledge and dietary self-efficacy) and the effect on college student’s body mass index could be further investigated to gain a better insight into these various relationships.
For example, the body mass index provides a reliable indicator of body fitness for most people and is used to screen for weight categories that may lead to health problems. As a measure of participant's weight relative to participant’s height and waist circumference, BMI reflects abdominal fat and total body fat. It is a good indicator of total body fat, which is the precursor needed to obtain information about an individual’s risk for developing obesity-associated diseases. BMI accounts for differences in body composition by defining the level of adiposity according to the relationship of weight to height, and therefore eliminating dependence on frame size. The scale indicates that, for people who are considered obese (BMI greater than or equal to 30) or those who are overweight (BMI of 25 to 29.9), and have two or more risk factors, the guidelines recommend weight loss. Even a small weight loss (just 10% of a person’s current weight) will help to lower risk of developing diseases associated with obesity. Research has indicated that individuals who are overweight or obese have a greater chance of developing high blood pressure, high blood cholesterol or other lipid disorders, type 2 diabetes, heart disease, stroke, and certain cancers (Anding et al., 2001; Dzokoto et al., 2007; Jackson et al., 2007; Luquis et al., 2003; McAthur et al., 2002).

The findings of this research along with future research can help college students increase their nutrition knowledge, and make wiser food choices regarding their overall health and lifestyle. This study showed that a college environment could be an excellent location to provide basic nutrition information. It is important to make sure that college students receive excellent nutrition information not only in college but from an early age.
Conclusion

This study provided an overview of the major theories that served as a foundation for our investigation. The discussion of the findings and past research revealed similarities and differences that may be helpful for future research. These findings indicate that a college student's body mass index is influenced both positively and negatively by several behavior factors.

There is no single factor that can be determined to affect body mass index. This research has provided information to better understand the various factors affecting college student's body mass index. It is critical when examining body mass index as an indicator of health and nutrition knowledge in any chosen population to have a comprehensive look at all the determining factors that plays a role in the outcome. Factors such as, engaging in unhealthy lifestyle behaviors, poor eating, drinking alcohol, not exercising, and smoking are especially important when examining a population such as college students in the United States. This is has also been confirmed repeatedly by the literature (Anding et al., 2001; Dzokoto et al., 2007; Jackson et al., 2007; Luquis et al., 2003; McAthur et al., 2002). As our findings indicated there are some factors that influence BMI, for example nutrition knowledge, it would be beneficial to focus health programs on nutrition knowledge awareness.

Studies examining the effect of nutrition education for college students have indicated an increase in healthy dietary changes and overall food choices (Gillespie & Shafer, 1990; Lazarus, Weinsier, & Booker, 1993; Lin, Guthrie, & Blaylock, 1996; Morton & Guthrie, 1998; Skinner, 1991; Thomsen, Terry, & Amos, 1998). It is recommended that exposure to nutrition education, regardless of the age of individuals,
be used as a catalyst for the development of lifelong behaviors aimed at improving BMI and overall health. Therefore, future studies focusing on college environments may be the ideal vehicles for implementing effective health education and prevention and intervention programs, as college students are creating lifestyle patterns during their college experience. In particular it would be important reference variables such as self-efficacy in, future intervention studies so as to examine the effectiveness of health-related outreach education in increasing self-efficacy beliefs and health value.

**Limitations**

The limitations refer to the internal and external weaknesses in the validity of the study. The limitations of this study are as follows:

1. This non-experimental study was weaker than an experimental design.
2. The sample size of 126 college students does not represent the entire college student population from across the United States. The sample size of 126 was not sufficient to generalize findings with confidence to the target population.
3. The data were collected from college students only in the United States; this was conducted via online surveys only. A selected different type of data collection, where a researcher could have a more generalized sample and interaction and feedback may have presented different results. A method where the research could have recorded their height and weight measurements (not participants self-recorded) may have presented different results.
4. Findings focused on normal and overweight groups. This was a limitation because it eliminated two groups (underweight and obese) from the population, which will in turn affect the generalizability of the study.

5. Survey Monkey, the questionnaire recruiting tools used for this study, offered respondents an incentive to participate in the survey, which may have posed a threat to external validity. In addition, risks of obtaining biased data resulting from respondents who recruit their friends to participate in the study may affect external validity, since the results may be difficult to generalize to the target population.

6. All participants self-reported their height and weight, which may have led to possible bias and unreliability.

7. The target population consists entirely of college students residing in the United States, but the online nature of the survey limits the interaction between researcher and participants as well as the opportunity for asking questions and engaging in open communication.

8. Respondents were not requested to identify their activity level or routine physical activity. This information may be useful in analyzing body mass index.

9. This study only examined three influencing factors personal characteristics, nutrition knowledge and dietary self-efficacy. There are more factors which could influence college student’s body mass index negatively or positively, such as, physical activity, pregnancy, or health related diseases (e.g. cancer).
Recommendations for Future Study

There are nine suggestions for future research. Recommendations for Future Study are as follows:

1. Based on the interpretations and conclusions from this study, future studies are recommended to further explore relationships between personal characteristics, nutrition knowledge, dietary self-efficacy, and body mass index among college student in the United States. No previous literature was found which investigates all of these variables in college students, in particular, within the United States, which may provide fertile ground for future research.

2. The demographics that are used in the sample population could be more closely examined. A majority of the sample population in this study were Caucasian and 18 to 25 years old.

3. Although the current research was used to explore relationships between personal characteristics, nutrition knowledge, dietary self-efficacy, and the effect it has on body mass index among college student, additional information is required and other potential factors such as, physical activity, pregnancy, or health related diseases (cancer) need to be included or taken into account in making a complete analysis. An area for future studies is to explore and collaborate, these other factors that may influence outcomes of body mass index.

4. Test this model with different sample population, geographical areas, and cultures.

5. Include all four standardized BMI categories: BMI below 18.5 is considered underweight, BMI between 18.5 to 24.9 is considered normal, BMI from 25.0
to 29.9 is considered overweight, and BMI of 30.0 and above is considered obese (HHS). Even though there are four categories of BMI, this study focused on two groups only, the normal (18.5 to 24.9) and overweight (25.0 to 29.9) categories. The inclusion of only these two categories was due to the primary interest of the researcher and also the limitation of time and resources. However this in turn affected the generalizability of the study. Further research should investigate the inclusion of all four BMI categories.

6. Conduct a qualitative study using this study’s model in order to capture the individual “human voice”. The target population consists entirely of college students residing in the United States, but the online nature of the survey limits the interaction between researcher and participants as well as the opportunity for asking questions and engaging in open communication. This will also encourage more accurate and precise weight and height measures for reliable body mass index indicators.

7. Future studies utilizing this study’s model to analyze personal characteristics, nutrition knowledge, dietary self-efficacy, in relation to body mass index, should be conducted using a cultural based questionnaire for the participants. A questionnaire that was tested prior for the selected population may be easier for understanding and comprehension in an online based study.

8. The results from this study may not necessarily represent the all the influencing factors which has effect on online questionnaires. All participants self-reported their height and weight, which may lead to possible bias and unreliability.

9. Using BMI as an indicator of nutrition knowledge and dietary self-efficacy also represents a limitation, as BMI reflects weight relative to height.
Studies examining the effect of nutrition education for college students on nutrition knowledge have indicated an increase in healthy dietary changes and overall food choices (Gillespie & Shafer, 1990; Lazarus, Weinsier, & Booker, 1993; Lin, Guthrie, & Blaylock, 1996; Morton & Guthrie, 1998; Skinner, 1991; Thomsen, Terry, & Amos, 1998). It is recommended that exposure to nutrition education, regardless of the age of individuals, be used as a catalyst for the development of lifelong behaviors aimed at improving BMI and overall health. Therefore, future studies focusing on college environments may be the ideal vehicles for implementing effective health education and prevention and intervention programs, as college students are creating lifestyle patterns during their college experience.

This study sought to explore the relationship between personal characteristic, nutrition knowledge, and dietary self-efficacy according to body mass index (normal and overweight) in college students in the United States. Findings indicated more research is needed to gain a clearer understanding and to investigate whether there are correlations between nutrition knowledge, dietary self-efficacy, and dietary behavior.

Chapter 5 discussed outcomes of the analysis related to answering the research questions and testing the hypotheses that resulted from the research purposes of this study. Findings were interpreted based on the review of literature and review of instrumentation. Theoretical and empirical studies and implications in addition to the conclusions drawn from interpretations were also discussed. The limitations of the study and recommendations for future study were addressed.
The researcher’s goal was to contribute to the growing academic literature based on nutrition knowledge, wellness and dietary self-efficacy principles and to also enhance awareness for college students on appropriate nutrition and health behavior.
References


Correlates of high-fat/low-nutrient-dense snack consumption among adolescents: Results from two national health surveys. *Journal American Dietetics Association, 10*(1), 85-88.


Bibliography


Appendix A

Survey Instrument
Survey Instrument

Part 1: Personal Characteristics

Instructions: Please select the response that best describes you by checking one item for each category.

1. Age in years:
   - 18-25
   - 26-30
   - 31-34
   - 35 and older

2. Gender:
   - Male
   - Female

3. Marital Status:
   - Married
   - Single, Never Married
   - Divorced or Separated
   - Widow or Widower

4. Race: (Select the primary race you consider yourself to be)
   - White
   - Black or African American
   - American Indian or Alaska Native
   - Asian
   - Native Hawaiian or Pacific Islander

5. Ethnicity:
   - Not Hispanic or Latino
   - Hispanic or Latino

6. Employment Status:
   - Currently not working
   - Currently employed (Part-time, < 40 hours weekly)
   - Currently employed (Full-time, ≥ 40 hours weekly)

7. Level of College:
   - Freshman (1 to 30 credits)
   - Sophomore (31 to 60 credits)
   - Junior (61 to 90 credits)
   - Senior (More than 90 credits)
Part 2: Nutrition Knowledge

Instructions: Please fill in the blanks or select the response by checking one item for each category.

8. Do you think health experts recommend that people should be eating more, the same amount, or less of these foods? (check one per food)

<table>
<thead>
<tr>
<th>Food Category</th>
<th>More</th>
<th>Same</th>
<th>Less</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sugary foods</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starchy foods</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatty foods</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High fibre foods</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salty foods</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. Which fat do experts say is most important for people to cut down on? (check one)
   (a) monounsaturated fat
   (b) polyunsaturated fat
   (c) saturated fat
   (d) not sure

10. What version of dairy foods do experts say people should eat? (check one)
    (a) full fat
    (b) lower fat
    (c) mixture of full fat and lower fat
    (d) neither, dairy foods should be cut out
    (e) not sure

11. Do you think these are high or low in added sugar? (check one box per food)

<table>
<thead>
<tr>
<th>Food Category</th>
<th>High</th>
<th>Low</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bananas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unflavoured yoghurt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ice-cream</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orange squash</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tomato ketchup</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tinned fruit in natural juice</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
12. Do you think these are high or low in fat? (check one box per food)

<table>
<thead>
<tr>
<th>Food</th>
<th>High</th>
<th>Low</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasta (without sauce)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low fat spread</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baked beans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luncheon meat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bread</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cottage cheese</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyunsaturated margarine</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13. Do you think experts put these in the starchy foods group? (check one box per food)

<table>
<thead>
<tr>
<th>Food</th>
<th>Yes</th>
<th>No</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheese</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pasta</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Porridge</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

14. Do you think these are high or low in salt? (check one box per food)

<table>
<thead>
<tr>
<th>Food</th>
<th>High</th>
<th>Low</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sausages</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pasta</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kippers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red meat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frozen vegetables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheese</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. Do you think these are high or low in protein? (check one box per food)

<table>
<thead>
<tr>
<th>Food</th>
<th>High</th>
<th>Low</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicken</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheese</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baked beans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cream</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

16. Do you think these are high or low in fiber=roughage? (check one box per food)
<table>
<thead>
<tr>
<th>Food</th>
<th>High</th>
<th>Low</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cornflakes</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Bananas</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Eggs</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Red Meat</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Broccoli</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Nuts</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Fish</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Baked potatoes with skins</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Chicken</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Baked beans</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

17. Do you think these fatty foods are high or low in saturated fat? (check one box per food)

<table>
<thead>
<tr>
<th>Food</th>
<th>High</th>
<th>Low</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mackerel</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Whole milk</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Olive oil</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Red meat</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Sunflower margarine</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Chocolate</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

18. Some foods contain a lot of fat but no cholesterol.
   (a) agree
   (b) disagree
   (c) not sure

19. Do you think experts call these a healthy alternative to red meat? (check one box per food)

<table>
<thead>
<tr>
<th>Food</th>
<th>Yes</th>
<th>No</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver pate</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Luncheon meat</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Baked beans</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Nuts</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Low fat cheese</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

20. A glass of unsweetened fruit juice counts as a helping of fruit.
   (a) agree
   (b) disagree
   (c) not sure

21. Saturated fats are mainly found in: (check one)
   (a) vegetable oils
22. Brown sugar is a healthy alternative to white sugar (check one).
   (a) agree
   (b) disagree
   (c) not sure

23. There is more protein in a glass of whole milk than in a glass of skimmed milk (check one).
   (a) agree
   (b) disagree
   (c) not sure

24. Polyunsaturated margarine contains less fat than butter (check one).
   (a) agree
   (b) disagree
   (c) not sure

25. Which of these breads contain the most vitamins and minerals? (check one)
   (a) white
   (b) brown
   (c) wholegrain
   (d) not sure

26. Which do you think is higher in calories: butter or regular margarine? (check one)
   (a) agree
   (a) butter
   (b) regular margarine
   (c) both the same
   (d) not sure

27. A type of oil which contains mostly monounsaturated fat is: (check one).
   (a) coconut oil
   (b) sunflower oil
   (c) olive oil
   (d) palm oil
   (e) not sure

28. There is more calcium in a glass of whole milk than a glass of skimmed milk (check one).
   (a) agree
   (b) disagree
   (c) not sure
29. Which one of the following has the most calories for the same weight? (check one).
(a) sugar
(b) starchy foods
(c) fiber (roughage)
(d) fat
(e) not sure

30. Harder fats contain more: (check one).
(a) monounsaturates
(b) polyunsaturates
(c) saturates
(d) not sure

31. Polyunsaturated fats are mainly found in: (check one).
(a) vegetable oils
(b) dairy products
(c) both (a) and (b)
(d) not sure

32. Which would be the best choice for a low fat, high fiber snack? (check one)
(a) diet strawberry yoghurt
(b) raisins
(c) muesli bar
(d) wholemeal crackers and cheddar cheese

33. Which would be the best choice for a low fat, high fiber light meal? (check one)
(a) grilled chicken
(b) cheese on wholemeal toast
(c) beans on wholemeal toast
(d) quiche

34. Which kind of sandwich do you think is healthier? (check one).
(a) two thick slices of bread with a thin slice of cheddar cheese filling
(b) two thin slices of bread with a thick slice of cheddar cheese filling

35. Many people eat spaghetti bolognese (pasta with a tomato and meat sauce). Which do you think is healthier? (check one)
(a) a large amount of pasta with a little sauce on top
(b) a small amount of pasta with a lot of sauce on top

36. If a person wanted to reduce the amount of fat in their diet, which would be the best choice? (check one)
(a) steak, grilled
(b) sausages, grilled
(c) turkey, grilled
(d) pork chop, grilled
37. If a person wanted to reduce the amount of fat in their diet, but didn't want to give up chips, which one would be the best choice? (check one)
(a) thick cut chips
(b) thin cut chips
(c) crinkle cut chips

38. If a person felt like something sweet, but was trying to cut down on sugar, which would be the best choice? (check one)
(a) honey on toast
(b) a cereal snack bar
(c) plain Digestive biscuit
(d) banana with plain yoghurt

39. Which of these would be the healthiest pudding? (check one)
(a) baked apple
(b) strawberry yoghurt
(c) whole meal crackers and cheddar cheese
(d) carrot cake with cream cheese topping

General nutrition knowledge questionnaire for adults

40. Which cheese would be the best choice as a lower fat option? (check one)
(a) plain cream cheese
(b) Edam
(c) cheddar
(d) Stilton

41. If a person wanted to reduce the amount of salt in their diet, which would be the best choice? (check one)
(a) ready made frozen shepherd's pie
(b) gammon with pineapple
(c) mushroom omelette
(d) stir fry vegetables with soy sauce

42. Are you aware of any major health problems or diseases that are related to a low intake of fruit and vegetables? (check one)
(a) yes
(b) no
(c) not sure

43. Are you aware of any major health problems or diseases that are related to a low intake of fiber? (check one)
(a) yes
(b) no
(c) not sure
44. Are you aware of any major health problems or diseases that are related to how much sugar people eat? (check one)
   (a) yes  
   (b) no  
   (c) not sure

45. Are you aware of any major health problems or diseases that are related to how much salt or sodium people eat? (check one)
   (a) yes  
   (b) no  
   (c) not sure

46. Are you aware of any major health problems or diseases that are related to the amount of fat people eat? (check one)
   (a) yes  
   (b) no  
   (c) not sure

**Please select the response by checking one item for each category**

47. Do you think these help to reduce the chances of getting certain kinds of cancer?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>eating more fiber</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>eating less sugar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>eating less fruit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>eating less salt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>eating more fruit and vegetables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>eating less preservatives/additives</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

48. Do you think these help prevent heart disease? (answer each one)

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>eating more fiber</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>eating less saturated fat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>eating less salt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>eating more fruit and vegetables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>eating less preservatives/additives</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

49. Which one of these is more likely to raise people's blood cholesterol level? (check one)
   (a) antioxidants
   (b) polyunsaturated fats
   (c) saturated fats
   (d) cholesterol in the diet
   (e) not sure
50. Have you heard of antioxidant vitamins? (circle one)
(a) yes
(b) no

51. If YES to question 54, do you think these are antioxidant vitamins? (answer each one)

<table>
<thead>
<tr>
<th>Vitamin</th>
<th>Yes</th>
<th>No</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Complex Vitamins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin K</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Part 3: Dietary Self-Efficacy

Whether you are trying to change your eating habits or not, please rate how confident you are that you could really motivate yourself to do things like these consistently, for at least six months. Please check the box that may apply to you. Please check one box for each question:

<table>
<thead>
<tr>
<th></th>
<th>I Know I Cannot</th>
<th>Maybe Can</th>
<th>I Know I Can</th>
<th>Does Not Apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>52</td>
<td>Stick to your low fat, low salt foods when you feel depressed, bored, or tense.</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>53</td>
<td>Stick to your low fat, low salt foods when there is high fat, high salt food readily available at a party.</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>54</td>
<td>Stick to your low fat, low salt foods when dining with friends or co-workers</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>55</td>
<td>Stick to your low fat, low salt foods when the only snack close by is available from a vending machine</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>56</td>
<td>Stick to your low fat, low salt foods when you are alone, and there is no one to watch you.</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>57</td>
<td>Eat smaller portions at dinner.</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>58</td>
<td>Cook smaller portions so there are no leftovers.</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>59</td>
<td>Eat lunch as your main meal of the day, rather</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td></td>
<td>I Know I Cannot</td>
<td>Maybe I Can</td>
<td>I Know I Can</td>
<td>Does Not Apply</td>
</tr>
<tr>
<td>---</td>
<td>-----------------</td>
<td>-------------</td>
<td>--------------</td>
<td>----------------</td>
</tr>
<tr>
<td>60</td>
<td>Eat smaller portions of food at a party.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>61</td>
<td>Eat salads for lunch.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>62</td>
<td>Add less salt than the recipe calls for.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>63</td>
<td>Eat unsalted peanuts, chips, crackers, and pretzels.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>64</td>
<td>Avoid adding salt at the table.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>65</td>
<td>Eat unsalted, unbuttered popcorn.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>66</td>
<td>Keep the salt shaker off the kitchen table.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>67</td>
<td>Eat meatless (vegetarian) entrees for dinner.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>68</td>
<td>Substitute low or non-fat milk for whole milk at dinner.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>69</td>
<td>Cut down on gravies and cream sauce.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>70</td>
<td>Eat poultry and fish instead of red meat at dinner.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

than dinner.

Eat smaller portions of food at a party.
Eat salads for lunch.
Add less salt than the recipe calls for.
Eat unsalted peanuts, chips, crackers, and pretzels.
Avoid adding salt at the table.
Eat unsalted, unbuttered popcorn.
Keep the salt shaker off the kitchen table.
Eat meatless (vegetarian) entrees for dinner.
Substitute low or non-fat milk for whole milk at dinner.
Cut down on gravies and cream sauce.
Eat poultry and fish instead of red meat at dinner.
<table>
<thead>
<tr>
<th>Item</th>
<th>I Know I Cannot</th>
<th>Maybe I Can</th>
<th>I Know I Can</th>
<th>Does Not Apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>71</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoid ordering red meat (beef, pork, ham, lamb) at restaurants.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Part 4: Body Mass Index

Please fill in the blank.

72. Height (without shoes) ____ ft ____ inches.

73. Weight (with clothes) ____ lbs.
Appendix B

Permission Letter to Use Theoretical Models
Hi Brent- thesis request.

Thanks!

Paulette Goldweber
Associate Manager, Permissions
Global Rights
John Wiley & Sons, Inc.

-----Original Message-----
From: Trisha Williams [mailto:]
Sent: Wednesday, December 01, 2010 2:03 PM
To: Permissions - US
Subject: Request to the Publishers for Permission

Request to the Publishers for Permission

John Wiley & Sons, Inc.,

111 River Street
Hoboken, NJ 07030.

December 1st. 2010.

Attention: Permissions Department

My name is Trisha Williams. I am a doctoral candidate in a PhD program at
Lynn University in Boca Raton, Florida. My major is Global Leadership, with a
specialization in Global leadership. I am currently working on my dissertation titled,

Health Beliefs, Lifestyle Behaviors, Nutrition, Health, and Well-being in College Students. I plan on doing an exploratory (comparative) survey design.
As part of my literature review, I was fortunate enough to read about the Theory of Reasoned Action, Theory of Planned Behavior, Social Cognitive Theory and the Health Belief Model in the book titled Health Behavior and Health Education: Theory, Research, and Practice authored by Karen Glanz and, Barbara Rimer. I am requesting permission to reproduce in my dissertation the figures used to display the theories and models for the Theory of Reasoned Action, Theory of Planned Behavior, Social Cognitive Theory and the Health Belief Model.

If permission is granted, I will include any statement of authorization for use that you request, or provide an APA note of permission to use the figure. The copyright holder will be given full credit.

I would greatly appreciate your consent to my request. If you require any additional information, please do not hesitate to contact me. I can be reached at the

My dissertation Chair is Dr. Farideh Farazmand, who may be reached at: 

Sincerely,

Trisha Williams

Dear Ms. Williams,

I am happy to grant permission to republish the content you requested.

Best wishes,

Brent

Mr. Brenton R. Campbell - Coordinator, Global Rights - John Wiley & Sons, Inc.
111 River St., MS 4-02 - Hoboken, NJ 07030-5774

Think Green - Please consider business costs and the environment before you print this email!
Appendix C

Permission to Use Nutrition Knowledge Questionnaire
To Whom It may Concern:

My name is Trisha Williams. I am a doctoral candidate in a PhD program at Lynn University in Boca Raton, Florida. My major is Global Leadership, with a specialization in Corporate and Organizational Management. I am currently working on my dissertation titled, Health Beliefs, Lifestyle Behaviors, and body mass index in College Students. I plan on doing an exploratory (comparative) survey design.

As part of my literature review, I was fortunate enough to read about the use of the Nutrition Knowledge Questionnaire design by Parmenter & Wardle (1999). I am requesting permission to reproduce and adapt the questionnaire by omitting filling the blank questions, as my survey will only be multiple choice in my dissertation. I will not be changing any sentence structure, but include multiple choices questions only.

If permission is granted, I will include any statement of authorization for use that you request, or provide an APA note of permission to use the figure. The copyright holder will be given full credit.

I would greatly appreciate your consent to my request. If you require any additional information, please do not hesitate to contact me. I can be reached at the

My dissertation Chair is Dr. Farideh Farazmand, who may be reached at:

Sincerely,
Trisha Williams
Dear Trisha,

Thank you for your letter requesting permission to use the Nutrition Knowledge Questionnaire. For access to the questionnaire, including scoring information, please visit our website:

http://www.ucl.ac.uk/hbrc/diet/resources.html

Good luck with your studies.

Best wishes,
Katriina

Dr Katriina Whitaker
Health Behaviour Research Centre
Department of Epidemiology and Public Health
University College London
1-19 Torrington Place
London
WC1E 6BT

Tel: +44 (0) 7000 41735 (internal 41735)
Fax: +44 7900 019017
Email: whitakerk@ucl.ac.uk
Web: http://www.ucl.ac.uk/hbrc/whitakerk.html
Appendix D

Permission to Use Eating Habits Confidence Survey
Ms Williams,

You have my permission to use the specified measure or any of the others posted on my website. Good luck with your dissertation.

Jim Sallis

James F. Sallis, Ph.D.
Professor of Psychology, San Diego State Univ
Director, Active Living Research.  www.activelivingresearch.org

3900 Fifth Avenue, Suite 310, San Diego, CA 92103

ph:  ; fax:  ; I CANNOT KEEP UP WITH MY EMAILS; FOLLOW-UP IF I DO NOT REPLY

-----Original Message-----
From: Trisha Williams [mailto:]
Sent: Tuesday, February 08, 2011 5:57 PM
To:  
Subject: Permission to use Eating Habits Confidence Survey

February 9, 2011 .

Dr James Sallis:

My name is Trisha Williams. I am a doctoral candidate in a PhD program at
Lynn University in Boca Raton, Florida. My major is Global Leadership, with a specialization in Corporate and Organizational Management. I am currently working on my dissertation titled, Health Beliefs, Lifestyle Behaviors, Nutrition, Health, and Well-being in College Students. I plan on doing an exploratory (comparative) survey design.

As part of my literature review, I was fortunate enough to read an article titled, "The development of self-efficacy scales for health related diet and exercise behaviors" which very much pertains to my topic. One of the variables being measured in my study is dietary self-efficacy. I am requesting permission to reproduce the self-efficacy scales for eating and exercise behavior in my dissertation. In particular, the "Eating Habits Confidence Survey" listed on your website at http://www.drjamessallis.sdsu.edu/Documents/selfefficacydiet.pdf.

If permission is granted, I will include any statement of authorization for use that you request, or provide an APA note of permission to use the figure. The copyright holder will be given full credit.

I would greatly appreciate your consent to my request. If you require any additional information, please do not hesitate to contact me. I can be reached at the

My dissertation Chair is Dr. Farideh Farazmand, who may be reached at:

Sincerely,

Trisha Williams
Appendix E

Permission to Use Dietary Guidelines for Americans
Hi Trisha,

Yes, you have permission to use this image. Please note that this image is from the 1995 version of the Dietary Guidelines for Americans and is outdated. HHS and USDA publish new DGA every 5 years.

The most recent version, Dietary Guidelines for Americans, 2010, was launched on Jan. 31 and can be found at: www.dietaryguidelines.gov

Best regards,

Kathleen A. Loughrey
240-453-8261

-----Original Message-----
From: Trisha Williams [mailto:
Sent: Monday, February 07, 2011 12:57 PM
To: Loughrey, Kathleen (OS/OASH)
Subject: permission request

Miss Kathleen Loughrey,
Thank you for contacting me, as prior to our conversation attached is a copy of the figure. I am requesting to include this figure in my paper. I am documenting in my paper this as a guide to support my study.

Thank you for your help.

The source is http://www.health.gov/dietaryguidelines/

Trisha Williams
Appendix F

Filtering Questions
Filtering Questions

1) Are you a college student within the United States?

2) Are you 18 years and older?